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FIGHTING DROUGHTS.

AN ANALYSIS AND SOME SUGGESTIONS.

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(*Continued from February issue.*)

The scheme outlined would be of considerable value if it could be established, because it would create an organised demand for fodder. Consequently supplies would be forthcoming to a degree. But this scheme, good as it may be in many directions, cannot hope to succeed, because there is no definite provision made to protect the producer of the fodder. Thus:—

1. Obviously, under this scheme, the purchase of the fodder would be made when the market prices were low. Further, if a sufficiency of fodder were conserved in, say, two or three years, no more would be bought. Hence, when the drought came, the conditions would be as follows:—

The high prices for fodder which are usually expected under drought conditions would not obtain. That is, the farmers would find themselves denied the high prices on which they now depend in order to partly compensate them for low yields in dry times.

Farmers generally would quickly recognise that such a situation had been rendered possible because they had produced and sold a surplus of fodder in the good seasons at a low price. The natural reflex action would be that farmers would restrict their production of fodder, and so fodder conservation would be rendered impossible.

2. In the above scheme an assumption is made that there would be a sufficient surplus of fodder grown to allow fodder conservation to be undertaken. It is more than doubtful, however, if this assumption is correct, for it cannot be expected that any true surplus of fodder will be produced unless the producer of the fodder is guaranteed a profit on his production.

The above scheme must fail because no provision has been made to meet this very essential feature. In the scheme, subsequently to be described, every precaution has been taken to protect those farmers who are called on to produce the surplus fodder for conservation.

3. The main objection, however, to the above scheme, and to all those other schemes constructed on similar lines, is this: If it is justifiable for the graziers to obtain Government assistance in order to buy fodder on a low market, would it not be equally justifiable for the farmers to seek Government assistance so as to enable them to hold their fodder as against the high prices which would normally rule in times of drought?

Under the conditions of the above scheme, and it is typical, the grazier is asking for Government assistance in order to make his work more profitable. Surely the farmer is equally justified in asking for Government assistance for his work. If Government is cut out, the whole problem becomes a purely commercial transaction between two opposing sections. To allow this, however, is undesirable, because our primary industries are basic to our national prosperity. Therefore, Government should take action, but such action as is taken must give equal advantages to both grazier and farmer. Beyond this we have to remember that many men are running stock and are farming on the same property.

Thus this discussion seems to have brought us to the conclusion that fodder conservation is the most important factor in the problem of fighting our droughts. Further, whatever the scheme for the conservation of fodder, it must be on lines of co-operation between grazier and farmer, though we must expect Government assistance, because the whole matter is of vital national interest.

With this I submit the following suggestive scheme, trusting it may be of some value when this matter of fodder conservation is brought up for serious argument.

SUGGESTED SCHEME FOR FINANCING FODDER CONSERVATION.

The object of the scheme is to provide an organisation whereby funds would be made available for the purpose of tiding the producer of fodder over that period of waiting which must elapse between the time of production in our good seasons and the time of sale or use in our bad seasons.

The argument set out above indicates that, to meet this situation, it is necessary to recognise conserved fodder as a safe security for a loan. Much of the following discussion, therefore, is necessarily devoted to an endeavour to show the lines on which fodder conservation (which is undoubtedly a good security for the nation), can be rendered a safe security for public investment.

The next object of the scheme is to stimulate the production of a true and large surplus of fodder during our good years and so render it possible to save our live stock as against the depredations of our droughts.

We cannot hope for the production of a surplus of fodder, however, unless it is made reasonably probable that the producer of the fodder shall make a profit.

In this respect it is evident that the greater the reserves of fodder which may be built up under any system of conservation, the less is the likelihood of high prices in times of drought. While low prices in times of stress are all in favour of the stock-raiser, they are against the interests of the farmer who is producing the fodder. This conflict of interest is the big difficulty in this problem, but it may be overcome under conditions set forth in the following scheme. In this scheme the suggested Fodder Conservation Bank should be in the position to guarantee to the fodder-producer a fair payable price during years of plenty. After several years of such profits the farmer should be in a position to forego high prices during the droughts.

But a drought may come before adequate reserves have been stored. Under such circumstances the conserved fodder must be quitted at high or fairly high prices, and it is necessary that any farmer who has placed his fodder under the conservation scheme, should obtain his share of those possible profits.

It will be seen below that provision for this has been made by the issue of conserved fodder certificates, thus allowing the farmer to retain an interest in the fodder he has conserved right up to the time of sale.

The security for the stockowners lies in the creation of large fodder reserves, for thereby, the prices of fodder in droughts would be kept low. These large reserves of fodder can be obtained by the whole-hearted support of the graziers in buying up fodder conservation bonds.

However, it is necessary that the investing stockowners should be protected against any undue holding of conserved fodder for the purpose of forcing prices above their true value. The suggested constitution of the Fodder Conservation Bank management should be a sufficient guarantee in this direction.

The third object of the scheme is to give the general public such an interest in the work that they will willingly invest their savings in fodder conservation bonds. To secure this investment it is necessary that conserved fodder should be made a truly safe security for a loan. The conditions set out below aim at this.

In brief, the objective of the whole scheme is to organise the nation in an endeavour to stabilise one of our greatest primary products as against our variable rainfall.

FODDER CONSERVATION BANK.

To handle the scheme some special organisation would be required which would act as an intermediary between the conservers of fodder, the users of the fodder, and the investing public. This organisation might be termed the Fodder Conservation Bank. In truth, fodder conservation might form one particular section of a Rural Bank which has been specially constituted for the purpose of handling agricultural and pastoral problems. Though fodder conservation only is dealt with here, it is believed that the conditions hereunder set forth are, with but slight modification, applicable to land mortgage, live stock loans, loans for re-stocking, loans for purchase of stud sires, &c. We will, however, confine this discussion to fodder conservation.

The Control of the Bank.—This should be placed under a board of five thoroughly practical men, one appointed by the Government to look after the interests of the investing public, two appointed by the investing graziers, and two appointed by the borrowing farmers who, as will be shown later, are of necessity investors also.

The Bank Fund.—In order to carry out its functions, the Fodder Conservation Bank will require funds. In the initial stages of any period of conservation the amount required will be small, but as reserves of fodder are built up so the funds required will increase. To meet this condition, it is proposed that the bank funds should be raised as follows:—

1. The Government to provide a limited sum, say, £100,000, to allow the bank to commence operations. Later the amount which Government provides might be set at a definite percentage of the bank's transactions. This sum would be in the nature of a fixed deposit by the Government, but it would also serve as an added security to the investing public in the event of the bank's failure.

This, in effect, is the general public's interest in the whole scheme, but not necessarily the interest of the investing public.

2. The bank to be empowered to issue bonds for public subscription, each bond issue to be secured, as will be shown later, on the actual fodder conserved. This issue might be termed "fodder conservation bonds," and they might be issued in £10, £25, £50, £100, £500, or £1,000.

Several conditions are suggested:—

(*a*) *Fodder conservation bonds to have a currency of 5 or 10 or 20 years, and to carry an interest similar to that paid on our national loans.*

(*b*) *The total permissible issue of fodder conservation bonds to be limited in accord with careful statistical estimates* of the probable requirements to meet a drought. From time to time, and as experience teaches, this limit might be altered by special enactment.

(*c*) *The issue of bonds at any one time to be dependent on the actual amount of fodder conserved.* Because of this condition it will be evident that the issue of fodder conservation bonds will be a gradually increasing quantity, depending on the gradual accumulation of fodder reserves. Further, the issue of these bonds will be during the good years when, because of the abundance of production, money is usually plentiful. Hence investors should be willing to accept a low rate of interest in return for safe security.

(*d*) *But this condition involves another point,* viz., that the bank would be required to buy up its own bonds to the extent to which it may have unloaded fodder in times of drought. This necessary recovery of fodder conservation bonds, particularly in view of the fact that their currency is for 5 or 10 or 20 years, would probably force the bonds above par. Because of this possibility, investment in fodder conservation bonds should be attractive.

It may be questioned whether it is justifiable for the Fodder Conservation Bank to be forced to buy up its own bonds at a premium. But a little consideration will show that this is correct. Thus:—

(i.) If the amount of conservation is small, say, because the time available for conservation has been short, then the selling price of that fodder under drought conditions would be high. Under such circumstances the Fodder Conservation Bank would be in the position to make big profits. The major portion of such profits would go to the producers of the fodder under the system of conserved fodder certificates, to be described hereafter. But another portion of these profits should justly go to those investors who have supported the scheme, and this would be attained because of the possible appreciation of fodder conservation bonds in times of drought.

(ii.) On the other hand, if fodder conservation has been going on through a number of good years and large reserves have been built up, it is obvious that the bond issue will be large. Thus, while the probable drought prices for the fodder would be low, so also the buying up of the bonds would be simpler and cheaper, both because the large issue of fodder conservation bonds would ensure that a number would be willing to quit, but also because many of the bonds would be nearing the end of their currency.

(iii.) Nevertheless there occurs here a very real danger that the Fodder Conservation Bank might be placed in an awkward position. Therefore the Government should be called on to take up 20 per cent. to 40 per cent. of all fodder conservation bond issue, the Government bonds to be redeemable at par and at the demand of the bank. Thus a very necessary element of security and stability would be introduced.

Fodder Conservation Bonds.—It has been advocated above that these bonds should be issued with a currency of 5 or 10 or 20 years. Probably it would be better if a portion were issued for 20 years, some for 10 years, and the remainder for 5 years' currency. In this way trust funds seeking permanent investment might be attracted by the long period bonds, while stockowners might be expected to prefer the short period bonds, merely because they might wish to realise, did drought conditions render it necessary.

As these bonds would be issued periodically and in accord with the building up of fodder reserves, it is obvious that the above arrangement would ensure that a number of bonds would be falling due at any given time. This, coupled with the Government bond holdings (*see* above) should place the bank in a secure position if it is forced to buy up many of its bonds because of a rapid unloading of its fodder stocks. At no time would the bank be forced to buy up the whole of its bond issue. This is rendered impossible because of its operations under Conservation B (*see* below).

However, the bank might be placed in a position where it is unable to buy up a sufficiency of its bonds to meet its unloading of fodder, in which case the bank would find itself with a surplus of funds because of the payment for fodder, such funds being idle and non-interest bearing. On this account, and under conditions carefully to be defined, the bank should be allowed to invest such funds in short-call securities. As the Fodder Conservation Bank would find itself with a superabundance of funds at the end of a drought (a time when money is usually scarce), there should be no difficulty in finding this outlet. Eventually this money would be recalled and invested in fodder conservation.

If fodder conservation were one section of a complete Rural Bank this rapid recovery of funds from the sale of fodder would be of distinct advantage, because it would place money in the hands of such a Rural Bank just at a time when agriculture urgently requires temporary assistance. The failure of our present system of financing agriculture lies exactly in this lack of a reserve to meet the aftermath of our droughts. In truth our present system of finance is such that money is usually extremely tight immediately following a bad drought. Yet, the least consideration shows that it is exactly at this period that agriculture requires assistance and support.

MARKET VALUE OF THE FODDER CONSERVATION BONDS.

Fodder conservation bonds should have a market value on our Stock Exchange. Should these bonds be below par at a time when the bank is asked to undertake further responsibility with regard to conservation, the effect would be that the bank would either have to charge the borrower a higher rate of interest on his loan, or else the amount advanced against fodder would have to be reduced. In either way it is the producer of the fodder who would have to suffer. This arrangement is quite justifiable, because the suggested Fodder Conservation Bank aims at quitting its conserved fodder at some profit and at distributing the major portion of such profits amongst those producers who have put fodder into the scheme. Thus, if the farmers are placed in a position to win if profits are made, so they must be prepared to lose if loss occurs.

However, if fodder conservation bonds did suffer any considerable depreciation over a length of time, the reflex action would be that the farmers would restrict their production and so render conservation difficult, if not impossible. On this account it should be distinctly to the advantage of the graziers to buy these bonds, and so hold them at a fair market value.

Also, in self-defence, fodder conservation rings (*see* p. 95) should buy bonds when they can.

Of course, if Government takes up 20 per cent. to 40 per cent. of all bond issue, as has been suggested above, this would steady the market.

THE FODDER CONSERVATION BANK'S FUNCTIONS.

If a bank were established as indicated above, the funds made available would be used for the purpose of advancing against conserved fodder. As has been indicated above (*see* page 54), there are three classes of fodder conservers. Each class has its risks and must be treated separately in order to establish its security. These three classes will be dealt with under the terms of "Conservation A," "Conservation B," and "Conservation C."

CONSERVATION A, OR, BETTER, FARM FODDER LOANS.

This section comprises the agriculturists who desire to hold their fodder for a limited period against seasonal variation in market prices. Many of this class merely desire to hold their material over from a period of glut in the full-growing season until the inevitable period of shortage in the non-growing season. Because of lack of funds many of these men are unable to do this. They have to realise in order to finance their home and working expenses. This gives the opportunity to the speculating merchant (*see* above, page 50). The speculator should not be in the position to make a profit in this matter; hence the necessity for this type of loss.

But there is another purpose that these loans would serve. With their assistance something approaching a normal annual value for each class of fodder would be established, and so allow of transactions under Conservation C (*see* page 96) to be undertaken with some chance of fair treatment to all concerned.

Advances to be made to conservers of fodder under this section are merely in the nature of a temporary assistance to tide over a limited period of waiting. Therefore the currency of such loan should not be for more than, say, two years. Should an extension of credit beyond this period be required, then the conserver *must* convert his holding to Conservation C (*see* below).

Conditions Appertaining to Conservation A Loans.—1. For Class A the advance against fodder conserved *shall not exceed an amount which may be previously determined as an approximate average cost of production.*

This being so, it can be anticipated that the fodder can always be disposed of at a value in excess of the loan on it. This security would be further enhanced by the operations under Conservation C. Hence there should be no incentive for the farmer to deliberately destroy his fodder, say, by fire, for he would always be in the position to gain a greater advantage by sale or by conversion to Conservation C. This places the individual farmer in a very secure position in the scheme.

The risk for the Fodder Conservation Bank, however, lies in the following:—The fodder may be accidentally destroyed by fire, or there may be actual malpractice—*e.g.*, a claim for excessive weight of fodder conserved, deliberate bad harvesting, or secret sale or disposal of the fodder without the bank's knowledge. To meet this the following *limited co-operative guarantee system is advocated*:—

The Limited Co-operative Guarantee System.—(*a*) Ten or more farmers, each desiring to obtain a farm fodder loan, *i.e.*, a loan under Conservation A, shall form a local fodder conservation ring or association, and elect their own management.

(*b*) The individual loans asked for shall carry the approval of the local management. This, however, will not commit the bank to make the loan, for, independent of the local management, the bank will have the right of investigation.

(*c*) Each farmer granted a loan under this section must take up fodder conservation bonds to the extent of 5 per cent. or perhaps 10 per cent. of his individual loan, such bonds to remain in force until the loan is fully repaid, when the par value of the bond plus all accrued interest shall be returned to the farmer.

(*d*) Each member of the Local Fodder Conservation Ring or association undertakes to pay to the bank an amount up to double the value of his fodder conservation bonds in the event of any member of his local ring failing. In this way each individual farmer's guarantee is strictly limited, yet the obligation is sufficient penalty to ensure that a "local ring" will not recommend any of its members for an improper loan.

(*e*) No farmer who has obtained a loan under this section is permitted to sell, or use, or otherwise dispose of his fodder unless with the sanction of his "local ring" management.

(*f*) This being so, any farmer may sell his fodder or portion thereof on notifying his "local ring," who in turn will notify the Fodder Conservation Bank authorities. In truth, this fodder might be sold under a certificate informing all agents that the proceeds must be paid to the vendor through the Fodder Conservation Bank.

(*g*) When a sale of fodder has been made, a repayment of the loan must be made in proportion to the amount sold. The "local ring management," because of their individual obligation, would see to this.

(*h*) If the fodder is used for any other purpose than sale, then the "local ring" management must be notified and they must take on themselves the responsibility of a fair estimate. Whatever the "local ring's" estimate of use, so the individual farmer must pay to the bank.

2. The interest to be charged to borrowers under this section Conservation A, *i.e.*, by those obtaining farm fodder loans, to be 2 per cent. in excess of the interest paid by the Fodder Conservation Bank on their issue of fodder conservation bonds.

3. Interest on the loan to be paid each six months.

4. Redemption of the loan in part or entirely, to be allowed at any interest date, such redemption to be independent of the compulsory repayment in the event of sale or use of the fodder.

5. It will be readily seen, especially when the conditions of Conservation C are taken into account, that all farmers borrowing under the conditions of Conservation A are well protected. It will also be noted that the independent action of this Class A, with reference to the open markets, must have a modifying effect on the bank in regard to any operations under Section C (*see* below).

CONSERVATION B, OR, BETTER, STOCK FODDER LOANS.

With this section we have a type of fodder-conserver who is quite distinct from Class A. Here we have men who are conserving fodder for the express purpose of feeding it to their own stock. Because of our erratic rainfall they may, and frequently will, be compelled to carry out much of their conservation in one or two good years, whereas the fodder may not be used for another three or four or more years. Thus, for this section of conservers there may occur a sporadic heavy expenditure, and such men will frequently require financial assistance. In this case, and considering the farmers individually, the security for a loan on fodder has little permanence, because the fodder may have to be used almost immediately. Still it must be allowed that if this conservation can be supported and stimulated, it would go far to stabilise the whole of our primary production and so be of vast national benefit.

Conditions Appertaining to Conservation B Loans.—To meet the peculiar conditions of this section, the following are suggested:—

(*a*) That the *Limited Co-operative Guarantee* system outlined above in Section A should be adopted. This would ensure the goodwill of a district as opposed to the individual.

(*b*) The advances against fodder held under this section shall only be to the extent of 60 per cent. of the estimated approximate cost of production.

(*c*) The currency of loans under this section shall not be for more than five years. The interest charged on these loans shall be 2 per cent. in excess of the interest paid on the fodder conservation bonds.

(*d*) The interest on these loans to be paid half yearly, together with a regular redemption of the loan in ten equal instalments. That is, that the whole loan should be worked off under the system of amortisation.

(*e*) Any borrower under this section is permitted to convert his holdings under Conservation C should he so desire, and subject to the conditions set forth.

The "limited co-operative guarantee" idea is fundamental to this section. For it is by such a means only that the bank can obtain any security as to the use of the fodder. The added security, however, is that not more than 60 per cent. of the cost of production of the fodder should be advanced. Whether this percentage may prove too high for safety or too low to stimulate production can only be determined by trial. But that some such limitation is justifiable is evident, because this type of agriculturist should be prepared to grow some fodder and conserve it for his stock each year. The assistance here suggested is merely to help him during times of exceptional expenditure, *i.e.*, during extra good years, when heavy conservation could take place.

Operations under this section should be large and should become proportionately larger with time. The main security for the bank lies in the co-operative guarantee, though this might be augmented by or replaced by a lien on the live stock. However, it is this section which will certainly protect the bank against the necessity of buying up the whole of its fodder conservation bonds at any one time. (*See* p. 93.)

FODDER CONSERVATION C, OR, BETTER, FODDER RESERVE LOANS.

In the two previous cases we have considered the individual who is a producer of fodder, and under both sections we can expect a considerable building up of fodder surplus. But this is not sufficient. Beyond this we want a large reserve for those stockowners who are so placed that, because of labour or climatic or field conditions, they are unable to conserve fodder. It would be wrong for these men individually to buy up or secure a lien on fodder conserved by others. This is patent, because in our great land we don't know when or where the drought may strike. It would be better if all surplus fodder were held under some central control so that it might be utilised immediately in that direction where it is most required. For this reason it is proposed that the Fodder Conservation Bank should purchase, under conditions, first-class fodder as occasion renders it feasible. This fodder should be placed in dumps situated with special reference to suitability for easy and rapid transit in times of need, or else the fodder may be stored in places where the supply of stock water is assured and the conditions are such that stock might be conveniently brought to the fodder.

Conditions Appertaining to Conservation C Loans.—It has been pointed out before that this Fodder Conservation Bank is an organised agency controlling the sale of conserved fodder. It is an agency acting on behalf of the producers of the fodder, but at the same time every precaution is being taken that there shall be no undue holding-up of stocks. That is, protection is given to the consuming stockman. Both Section A and Section B classes of loan should stimulate the farmers, the producers of fodder, to grow a surplus in good years. It cannot, however, be expected that the farmers should accept the whole risk of waiting. Therefore, as the surplus of fodder builds up, it must be taken up by the bank. For this purpose the following conditions are suggested:—

1. The bank will accept delivery of fodder which has been inspected and passed as of approved quality.

2. For this fodder the bank will pay, at the point of delivery, a predetermined price based on the statistical average over a number of years. Hence the value of operations under Section A. (*See* p. 95.)

3. On delivery the producer will be paid as above, but beyond this he will be given a *conserved fodder certificate* which would entitle him to a proportionate share of the bank's profits in the event of sale of fodder. Such fodder certificates might be given a life of five years from date of issue.

4. Obviously the selling price of the conserved fodder must be high if only a restricted reserve has been built up, and under these circumstances, the producer of the fodder should receive his share of the profits. On the other hand as larger reserves of fodder are obtained so the probable selling price must become lower. Therefore, *if these conserved fodder certificates are made saleable paper*, it would be to the advantage of stockowners to purchase them at the highest market value they possess, for by so doing they would assist to stimulate production of fodder. Nor could the stockowners stand to lose in this purchase. For, if a drought comes before reserves have been built up, so prices for conserved fodder must be high, bank profits must be high, and consequently payment on the conserved fodder certificates must be high.

But if large reserves of fodder have been built up, the price of conserved fodder certificates will be low and so would be the price of fodder, which is exactly what the stockowner wants. On the other hand, if the farmer has received a fair payable price for his fodder over a number of years, he should be well satisfied to forego high prices in times of drought.

FODDER CONSERVATION BANK PROFITS.

It will be gathered from the above detailed description that the suggested Fodder Conservation Bank is practically a co-operatively organised agency established for the purpose of controlling the conservation of fodder and its sale in times of need. In the bank organisation we have the *fodder conservation bond* holders on the one hand and the *conserved fodder certificate* holders on the other. The bank is acting in the interests of each and, therefore, in all its transactions it must aim at making such profits as will enable it to—

1. Pay the guaranteed interest on the fodder conservation bonds;
2. Pay some dividend on conserved fodder certificates; and
3. Build up a safe reserve fund (*see* later),

always provided there shall be no undue holding, to force prices up, with the object of paying excessive dividends on conserved fodder certificates. (*See* page 92.)

HOW BANK PROFITS CAN BE ASSURED.

1. It is evident that the Fodder Conservation Bank should make profits from its operations under the arrangements for Conservations A and B, always provided the conditions set forth are sufficiently stringent to ensure safe security. In each of these sections a direct loan is made to farmers who are then charged an interest which is 2 per cent. in excess of the interest which the bank pays its bondholders.

It may transpire, with experience, that this excess of 2 per cent. is too little or too much. (In this regard it is interesting to note that the Federal Farm Loan System of U.S.A. permits of an excess interest of not more than 1 per cent. on land mortgages.) Further interest is payable each six months, together with a partial redemption of the loan, so that the bank should always possess some funds for further operations.

2. But when we come to Conservation C we find very different conditions. Under this section the Fodder Conservation Bank is called on to expend money for the purchase of fodder, and on the annual charges of supervision, &c., and to accept the loss due to the shrinkage of the fodder and the risks of fire or other loss. For all this expenditure there is no regular half-yearly or yearly interest coming in. Instead, the bank has to wait until the fodder is sold before it can recoup itself. Therefore it is necessary that the ultimate selling price shall be sufficiently high to cover all accumulated charges.

If we assume that 7 per cent. per year is sufficient to pay all annual charges, say, 5 per cent. to bondholders and 2 per cent. for all other bank charges, then the approximate average cost of any conserved fodder may be got by taking into consideration—

(*a*) The probable shrinkage of the fodder; and
(*b*) The initial outlay plus 7 per cent. compound interest for the number of years stored.

Suppose that the bank bought up lucerne hay, say, at £4 per ton and that 100 tons were purchased in each successive year, then the following table illustrates how an estimate of the cost of conservation might be arrived at:—

Time.	Quantity of Fodder.	Value at 7 per cent. Compound Interest.	With equal Quantities of Fodder Stored each Year.		
			The Accumulated Storage.	The Accumulated Cost.	Average Value per Ton.
	Tons.	£	Tons.	£	£
At start	100	400	..	..	...
End of—					
1 year	90	428	90	428	4·76
2 years	85	458	175	886	5·07
3 years	82	490	257	1,376	5·35
4 years	81	524	338	1,900	5·62
5 years	80	561	418	2,461	5·89
6 years	80	600	498	3,061	6·15
7 years	80	642	578	3,703	6·41
8 years	80	687	658	4,390	6·67
9 years	80	735	738	5,125	6·94
10 years	80	787	818	5.912	7·23
11 years	80	842	898	6,754	7.52
12 years	80	901	978	7,655	7·83
13 years	80	964	1,058	8,619	8·14
14 years	80	1,031	1,138	9,650	8·48
15 years	80	1,104	1,218	10,754	8·83

Column 2 shows an assumed shrinkage of the fodder through a number of years, it being taken that there would be practically no shrinkage after the first five years.

Column 3 shows the increasing capital expenditure calculated at 7 per cent. compound interest on the initial outlay.

Column 4 gives the total weight of conserved fodder, and is obtained from column 2 by successive additions.

Column 5 gives the total capital expenditure on the conserved fodder at the end of each year and is obtained from column 3 by successive additions.

Column 6 shows the estimated average cost per ton for conservation at the end of each year.

In some such way as the above an estimate of the cost of the conserved fodder might be arrived at. Having obtained this valuation we can consider the conditions which would protect the bank against loss.

Thus it might be established by enactment—

(*a*) *That the Fodder Conservation Bank shall not sell its conserved fodder at a price which is less than* 10 *per cent. in excess of the estimated cost of conservation at the time.*

By this, an assurance is given that the transactions of the bank under Section C shall yield a profit over and above that required to pay interest on the fodder conservation bonds, bank charges, &c. This profit would be distributed partly as a dividend on conserved fodder certificates and partly in building up a reserve fund.

(*b*) *That the bank shall not sell its conserved fodder at a price which is more than* 10 *per cent. below open market rates, except that it is herein provided that the selling price shall not at any time exceed the estimated cost of conservation by more than* 50 *per cent.*

The first part of this condition aims at preventing speculation in conserved fodder, while the second part gives the bank great powers in regard to steadying booming markets.

This condition, however, renders it possible for the bank to make large profits, but this could only occur under conditions which would have enabled the producer of the fodder to have made even greater profits had he held his fodder under his own control.

(*c*) *The bank shall not sell its fodder until the market values have reached some predetermined limit. This limit might reasonably be the estimated cost of conservation at the end of five years, plus* 10 *per cent.*

The term five years has been taken because, on a rough average, we get one bad year in every five or six, and also (*see* table above) because at 7 per cent. compound interest, the cost of conservation has increased the initial buying price by about 50 per cent.

The object of this condition is to prevent the Fodder Conservation Bank operating in fodder on the seasonal fluctuations of market values—Conservation A provides for such operations.

(*d*) *Whenever the estimated cost of conservation has reached a limit which has exceeded the estimated cost of conservation in the fifth year by* 50 *per cent., the Fodder Conservation Bank shall be relieved from the above conditions, and shall be permitted to sell the fodder at this limit and without profit. Further, even though the estimated cost of conservation shall have risen above this limit, because of forced holding, the bank may still sell at this limit.*

This is a very necessary provision, for it might happen that the bank was committed to such a prolonged period of waiting that further holding of the fodder would be, not only unprofitable, but would also involve a loss. It is not likely that such a condition would arise for (*see* the above table) it would probably require some fifteen years to reach the limit of value stipulated above. Still the condition might arise and, therefore, the bank should be in a position to cut its losses with as little delay as possible.

As a possible though improbable loss is here indicated, the bank must build up a substantial reserve fund to guard against failure.

(*e*) *The Fodder Conservation Bank shall be under no compulsion whatsoever to sell its conserved fodder on demand, even though all the above conditions as to market values shall be satisfied.*

This is a necessary provision in order to protect the bank against demands actuated by a temporary shortage in an otherwise fair season, when for the bank to operate would be detrimental to the producers of fodder and merely advantageous to certain improvidents. Whether the bank would or would not sell at any time would be largely determined by the statistical reports received from its fodder appraisers.

FODDER CONSERVATION BANK RESERVE FUND.

With these conditions in force there should be little doubt as to profits under Conservation C. It has already been pointed out that profits are assured under Conservations A and B. Out of these profits the bank should build up a reserve which would be required for the following purposes:—

(*a*) To meet possible defaulted loans under Conservations A and B.

(*b*) To meet possible losses under Conservation C due to fire, &c.

(*c*) To meet possible loss under Conservation C due to the compulsory sale of fodder at a price below the actual cost of conservation, such a possible contingency arising because the period of conservation has extended over an exceptionally long time (*see* page 99).

(*d*) To enable the bank to make regular interest payments to its bondholders. During the period of conservation the bank must have much of its money locked up in conserved fodder, and realisation of the principle, together with probable profits, is not possible until the sale of this fodder has been effected.

In this regard, the amount paid as interest to bondholders might be carried to a suspense account, this account to bear a compound interest at the same rate as that payable on the fodder conservation bonds. This suspense account would be debited against the reserve fund, but on the sale of the fodder the reserve fund would be credited with the amount of the suspense account, together with all accrued interest on that account.

The Fodder Conservation Bank might be required to devote 20 per cent. of all profits each year to the building up of this reserve fund until such time as the reserve shall have reached an amount which is equal to 25 per cent. of the permissible bond issue (*see* page 93). Until such a reserve has been fully built up, Government might be asked to back the bank to the extent of any difference between the actual bank reserve and 25 per cent. of the value of the then existing bond issue.

This reserve fund could only be invested in certain specially defined ways for, of necessity, it must be held as a liquid asset.

STATISTICAL SECTION OF THE BANK.

Throughout this discussion the necessity for statistical estimates has been several times mentioned. These estimates, in reality, form the very basis for the bank's successful operations.

First, a carefully compiled estimate of the probable fodder requirements for average droughts (if there is such a thing as an average drought) is essential to any conception of a safe margin for the bank's limit of operations (*see* page 93 2*b*).

Second, under Conservations A and B the loans made by the bank are based on the estimated average cost of production. Here again we have quantities which we can only hope to arrive at by means of careful statistical investigation (*see* pages 95 and 96).

Third, market prices require to be watched and tabulated so as to permit the bank to establish a fair estimate for its operations under Conservation C (*see* page 97).

Fourth, the bank requires to be fully informed as to condition of crops, private holdings of fodder, condition of different districts, &c. This information requires to be right up to date in order to enable the bank to decide whether it should sell or not (*see* page 99). In this regard much assistance can be got by reports from those experts who are called on to pass fodder before purchase by the bank. These experts—they might be termed "fodder appraisers"—would be all over the country and should be in the position to furnish the bank with sound information. Another source from which good information could be obtained is from the local fodder conservation rings. But an even wider source of information would probably be required. All this statistical information would have to be recorded and tabulated and analysed, hence the necessity for a statistical section in the bank.

To begin with, it is not likely that a high degree of accuracy would obtain in many of the estimates, but a rapidly increasing degree of accuracy must result from the work of this section of the bank.

CONCLUSION.

Under the provisions set forth it would seem that ample security would be obtained, and so it could be anticipated that the public, once they realised the conditions, would support the scheme by investment in fodder conservation bonds.

With the assistance and protection afforded to the producers of fodder, as detailed under the several sections above, they should be induced to grow a true annual surplus of first-class fodder for conservation. Under existing conditions it is doubtful if any true annual surplus of fodder is ever grown. When a drought comes and there is a big demand for feed, any and all sorts of rubbish is collected, is put on the market as chaff, say, and is sold at exorbitant rates. But this rubbish is not true fodder, and it is more expensive than its price indicates, because of its utterly inferior quality.

With the large reserves of first-class fodder which, under the above scheme, the Fodder Conservation Bank should be able to build up, an ample security is given to the stockmen that they would be protected against much of the loss which is now imposed on them by the droughts.

But more than this: Should the scheme prove workable and worthy, there is every likelihood that it could be extended to such a degree that it would enable our graziers to stock up more heavily in good seasons, for there would be the protection of the fodder reserves behind them. In other words, such a scheme, if successful, would allow Australia to produce more in accordance with the possibilities of her average rainfall rather than, as at present, under the limiting impost of her recurrent droughts.

The object of the scheme has everything to commend it. I can only trust that this analysis may prove of some value in the solution of this, our greatest, problem—Fighting Droughts.

QUEENSLAND WHEAT POOL.

Though 1920 witnessed the formation of Queensland's first Wheat Pool, it must not be inferred that the idea as far as this State is concerned was a new one. Since the institution of the Pooling System in the Southern States, an agitation—faint at first, but growing in volume—has been continued until Queensland's wheat-growers have been placed in the happy position in which they are to-day.

On no less than two previous occasions, farsighted representatives of our growers were able to induce a sympathetic Minister for Agriculture and Stock to approach the Southern authorities, per medium of the Chief Secretary, with the object of securing Queensland's entry into the Southern Pool, and thus ensuring for wheat farmers the benefits being derived by their fellows in New South Wales, Victoria, and South Australia. The attempts, however, were unsuccessful, and for the time the matter was allowed to lapse.

Shrewd judges foresaw early in last year that, given beneficent weather, a record crop for Queensland was assured. Such was also the case in the Southern States. There, however, the system of Pooling was in operation. It had become practically necessary for Queensland to establish some similar system of control for various reasons. There was the danger of entry into Queensland of Southern wheat and flour, to the detriment of Queensland growers, whose own crop was probably more than sufficient to meet the whole of Queensland's needs. There was the further danger of the growers glutting their own markets, with the resultant certainty of a fall. There were innumerable other dangers and difficulties, such as marketing the surplus, railing, and shipping.

Meantime the tide of events in another quarter was sweeping towards the same goal. A sympathetic Minister for Agriculture, Mr. W. N. Gillies, realising the necessity of assisting the farmer after a succession of bad seasons and resultant fruitless toil, had influenced the Government to guarantee to Queensland growers a price of 8s. per bushel for all wheat of prime milling quality harvested during the 1920-21 season. The New South Wales Government had given a somewhat similar guarantee, and at a conference of Premiers with the Prime Minister it was decided to fix the price of milling wheat at 9s. per bushel, on a seaport basis, throughout Australia. Thus it was more than ever apparent from the growers' viewpoint that, to prevent exploitation and to secure for them the full benefit of these attractive prices, a central controlling body was essential.

A central controlling body to take advantage of the high price fixed and regulate the market was the only solution.

When, therefore, strong representations were made by the representatives of the growers, they found a sympathetic Government. "*The Wheat Pool Act of* 1920" was passed, and without loss of time the Minister for Agriculture, Mr. W. N. Gillies, had constituted a Wheat Board, comprised, with one exception, solely of wheat-growers. Mr. F. J. Morgan, Chairman and Financial Adviser, the exception referred to, held the position of manager of the Toowoomba Branch of the Bank of Queensland, and, as he had taken a prominent part in the agitation for the constitution of the Pool, and was, moreover, unanimously chosen by the selected representatives of the growers, it will be seen that Mr. Gillies had sufficient confidence in them to allow the farmers to, themselves, control their first Pool.

As was to be expected, many of them treated the innovation warily. Nearly two months' operations, however, have convinced them that they are now in possession of a power which they have striven for years to attain. By means of the Pool they have established complete control over the market. With a limited staff in its one and only office, the State Wheat Board is controlling the trucking (with the permission of the railway authorities), storage, and marketing of the crop. As for marketing without control by the Board, it was clear, as Mr. F. J. Morgan, Chairman, stated recently, in addressing the Toowoomba Chamber of Commerce, that considering the heavy crop the market would be glutted and the man who got in first would have got the good price. A Southern commercial gentleman of high standing had informed him (Mr. Morgan) that without pooling arrangements in Australia, in view of the enormous harvest, wheat would be worth little more than 1s. per bushel. It must be also borne in mind that, even with the prospect of securing a fair price without central control, the sum entailed by growers in the payment of agents' and merchants' handling charges, commission, &c., would in the aggregate be considerably greater than the amount it would cost the Board with its compact methods and efficiently conducted system of marketing.

The Board has also covered by insurance the whole of the season's crop from the time it has been bagged on the farms.

Queensland's system of control is more complete than is the case in any of the Southern States. There, much of the work in connection with handling and transport is left in the hands of their paid agents, the latter also having the work of issuing the certificates of payment. Here the State Wheat Board employs no agents. Beyond inspectors to watch the interests of growers at the mills, the whole of the staff is centred at Toowoomba.

The Queensland Board has also decided to cater for the growers by creating a subsidiary Pool for the marketing of inferior wheat. It is, of course, understood that this will finance itself, and enable the Board to make periodical payments to farmers interested. By this action the market has been stabilised, and much better prices will be secured than would have been the case had the sales of this class of wheat remained uncontrolled. In the Southern States this advantage has not been secured to the farmers. The different Wheat Boards assist the growers by arranging for marketing, but the proceeds are not pooled. Consequently it is a case of "first in, first served"—and it might be added, best served.

THE FARM PRODUCE AGENTS ACT.

It is apparent, from inquiries and complaints received by the Department of Agriculture and Stock, that the provisions of the Farm Produce Agents Act are not clearly understood by the agents and the farmers. Farm produce agents are obliged to renew licenses yearly, but their obligations do not cease there. A record of all consignments received, together with particulars of their sale or other disposal, must be kept. Account sales must be forwarded to principals within fourteen days after the sale of produce, and must contain the name and address of the agent and of the consignor, the date of receipt and sale of the produce, giving its class and weight, or quantity, details of all charges, and the rate of commission charged.

Upon sale of produce the balance of the proceeds, after deduction of commission, expenses, and any money owing to the agent by the principal, must, if not paid immediately to the principal, be paid into a bank to a trust account, and is not available for payment of any other creditor of the agent. No agent or employee is entitled to purchase, without the consent of the principal, any produce forwarded to him for sale, and in the event of consent being given, no commission is chargeable.

Any consignor, or any other person with his written authority, may, upon giving seven days' notice to the agent, inspect and take copies of any entries relating to his consignment.

LUCERNE-GROWING.

Since the rapid expansion of the dairying industry in Queensland, great attention has naturally been paid to experiences carried out at the Queensland Agricultural College and on the State Farms with several varieties of fodder. Amongst these, lucerne was found to be the best of all feeds for farm animals, including even swine and poultry. No single forage plant contains the materials for a profitable ration for dairy cows, sheep, and swine in the same degree as lucerne. The abundant root development of lucerne, and the great depth to which the roots extend when once established, enable the plant to secure food and moisture several feet below the surface, in some authentic cases as deep as 20 feet.

Good growths of lucerne are often secured in favourable seasons on level land, but better results will be obtained on land that is slightly sloping, where water will not stand during any season of the year. "Patchy" fields are hard to renew, and often necessitate reploughing and resowing. In no case should lucerne be sown on land that is subject to overflow, or where the water-level is but 2 or 3 feet below the surface. Lucerne will grow on a wide variation of soil, ranging from a rich sandy loam to a heavy clay; but a rich clay loam over a gravelly subsoil seems to be the best. It is practically useless to grow lucerne on sandy or "worn-out" soils without an abundant supply of good barnyard manure. Mr. W. D. Lamb, of Yangan, was a good authority on lucerne-growing, and his advice on the subject is a good guide to the lucerne-grower of to-day. He once wrote the following instructive paper on the subject for publication in this journal:—

"In the coast districts of Queensland, lucerne thrives best on alluvial flats and pockets on the banks of the creeks, where the lands are periodically fertilised by the overflow from the streams. Lucerne is a deep-rooter. It strikes down to a depth of 15 feet, and even from this depth continues to descend until it meets a hard subsoil or clay, which the roots cannot penetrate. When the plant reaches this stage it is at a standstill. Deterioration shortly afterwards begins to manifest itself, and the plant loses its vigour. Lucerne will hold fairly good for ten years. After this space of time the natural grasses begin to show, and the lucerne dies out. Land in which it is intended to plant lucerne requires good cultivation, and should be thoroughly mixed; three crops, at least, of maize or wheat should be taken off the ground prior to the sowing of the lucerne seed. These croppings cause the land to be worked thoroughly, and enable the agriculturist to rid the paddocks of all natural grasses, including couch and nut grasses, which are the deadly enemies of lucerne. If these are allowed to remain, the lucerne will not thrive, but will die out in a short time.

"On the rich lands of the Darling Downs and on the plains in the Lockyer district, lucerne thrives to perfection.

"The following instructions for growing this crop are intended more for the benefit of new settlers than for those farmers who have for many years been successful growers of this invaluable stand-by of the dairy farmer:—

"' The best land for lucerne is a deep alluvial soil, such as that on the banks of many of our rivers and creeks. If this is not procurable, the next best is that of the deep black soils of the plain country of the Darling Downs and other parts of the State. Shallow land, or land having a hard, retentive clay subsoil or hard-pan, should be avoided, as the lucerne plant is a deep rooter and requires a deep soil for its full development. No land is well adapted for lucerne-growing unless it contains a sufficient quantity of lime, as the presence of this plant-food is essential to its growth.

"' PREPARATION OF THE LAND.—Plough the land deeply some months before the seed is sown, so as to get it into the right condition. That means that the whole furrow must be brought into a state of fine tilth, so that when the seed germinates the young roots will be able to at once strike down deeply into the soil.

"' SOWING.—The best time to sow the seed is from the middle of March to the end of April, as this enables the lucerne to get a good roothold before the winter sets in, and thus be able to withstand the effects of the frost.

"' The drill is undoubtedly the best machine with which to sow the seed, as by its means the seed is more evenly distributed over the land than by hand sowing. From 10 lb. to 20 lb. of seed is usual per acre.

"' I believe in sowing the seed through the coulter, not by means of a broadcast drill, as the seed is thereby placed at an even depth and, consequently, comes to the surface more regularly. It is a good plan to attach a light wooden harrow to the drill so as to smooth the land behind the drill, and to follow this by rolling as soon after as possible.

"' If the seed is sown in autumn, the lucerne will, in an ordinary season, be fit to cut for hay in September. Lucerne is best sown by itself, as the presence of stubble or other rubbish, which is always present when the seed is sown with wheat or oats, is thus avoided.

"' AFTER CULTIVATION.—Once lucerne is established, say in twelve months after seeding, it is a difficult matter to over-cultivate it. The spring-tooth harrow or disc harrow is a grand implement to run through the lucerne after each crop is taken off, but if this is not always practical there must be at least one cultivation every spring. The more lucerne is cultivated the better it grows.

"' HARVESTING.—The best time to cut lucerne for hay is just when the first blossom is showing. The great mistake which most of our lucerne-growers make is in allowing the lucerne to get too far advanced before cutting.

"' GRAZING.—The great trouble in grazing lucerne is, that sheep and cattle are very liable to what is termed "blowing," but this can be overcome to a great extent by not letting the stock on to a paddock until the lucerne is 6 or 7 inches high. Once on lucerne, let the stock stay there, and, if this precaution is taken, my experience has been that there is practically no danger from "blowing."

"' LUCERNE FOR SEED.—When lucerne is being grown for seed, the plants should be at least three years old, as it is not advisable to take off a crop of seed till the plants have reached full maturity, and become thoroughly established. A dry season is far better for getting a crop of seed than a wet one.

"' The best time to cut lucerne for seed is when the lower pods are quite ripe and the upper pods are just turning brown.

"' Cut with an ordinary mower, taking care to remove the crop as cut out of the way of the horses by having one or two men to follow the mover for this purpose. A sidedelivery reaper, or a reaper and binder without string binding attachment, can also be used.

"' When cut allow it to become thoroughly dry before stacking, or, better still, if machinery is available, thresh at once from the field, without stacking.

"' The ordinary wheat-threshing machine is suitable for threshing lucerne—in fact, it answers the purpose very well, with a little alteration.

"' YIELD.—The yield of seed per acre varies from 50 to 400 lb. per acre, which, provided all weather conditions are favourable, is a good paying crop, but the risks are great, as at least two good crops of hay have to be sacrificed to get one crop of seed.' "

THE COTTON INDUSTRY.

Referring to the visit of Messrs. Vaughan, Johnstone, and Armstrong, representatives of the British Cotton Growing Association, who are investigating the possibilities of profitably growing cotton in Queensland, Mr. David Jones, cotton expert, who was deputed by the Minister for Agriculture to accompany them as cicerone to the existing cotton-growing districts, gave to the "Daily Mail" (11th February) the following notes on his mission:—

"At a reception given to the visitors by the civic authorities at Cairns, the subject of cotton-growing was naturally discussed in its most serious economic aspect, and opinions were expressed by Dr. Reid, a well-informed sugar-grower, as to the expediency of embarking in the production of cotton in a country where labour conditions are deemed to be adverse. He thought that caution should be observed, instancing the difficulty experienced in the north with labour for rural pursuits in particular. Fortunately for the cotton-grower he is of all settlers engaged in agrarian operations the most independent of his class in respect to the question of labour, be it in supply or cost. Cotton, like sugar, has a harvest period extending over several months, according to the type of plant cultivated. This being so, a grower is not harassed by economic, labour, or other conditions to the extent experienced by the sugar-grower. Cane must be cut at the opportune time, and must be delivered without delay; hence a great deal of rush work, adding to the costs is unavoidable. With cotton it is not so. If a farmer has a good lot of fibre exposed he is in no way compelled to hustle more than he cares in order to gather the article. If he has no ability to pick the fibre one day, he can safely leave it until a more convenient time, be it a week or a month, or even more. The question of cost of labour in connection with cotton-growing has been much magnified by folk unfamiliar with the subject. It is often said that wages in Queensland are on too high a scale to make the production of cotton profitable. As counter to this idea, I have definite proof that, even if wages are paid much in excess of what is ordinarily given in farming districts, we have evidence that the crop can be profitably raised. During a visit to the Central district recently, Mr. Vaughan and party obtained conclusive data that, given ordinary seasonal conditions and the means to cultivate the crop on up-to-date methods, it is patent that cotton, as a family occupation, can be more cheaply raised here than is the case in other countries, whatever the character of labour employed. Many planters were interrogated as to cost of bringing an acre of cotton to harvest period in scrub and forest areas, and the answer was in every instance such as to show that we can

compete in the world's markets with profit. A grower at Capella showed me his accounts for the cost of tillage of his 10-acre plot, and the total expenses of ploughing, scuffling, chipping, and thinning was £31 10s. He had credited himself with a generous cost for ploughing—35s. an acre—and paid a labourer 15s. 6d. per day for field work. On this excessive basis of cost, his crop will, by a fraction, exceed three farthings per pound of seed cotton, and, if his yield exceeds the 1,000 lb. of fibre per acre expected, it will be much less. Or, if it reaches what one grower in the Dawson Valley scrub averred his 1918 crop attained—a return of 2,000 lb. of seed fibre per acre—then the cost per pound will be very low indeed. As it takes 3 lb. of seed fibre to make one of lint, it will be seen that the cost per pound of lint is lower than that estimated in most other countries, even allowing 1d. per lb. in seed for picking. On scrub areas, the cotton seed is sown on the newly burnt plot, and the planting is done among the stumps with the hoe or an American maize planter, after the seed is clayed or submitted to other processes to allow it to run in the machine. By these means growers show that the cost of raising the crop to picking period will not exceed 15s. per acre. It will be at once conceded that, if the planter can get his cotton ready for the picking, and sold at the State guaranteed price of 5½d. per lb., it follows that a picker, if gathering 100 lb. a day, wins over £2 worth of cotton by his task each day. Realising this to be the case—and it can be done each day for several months in the year—it follows that the high estimate of labour costs has to be related to what can be earned in the vocation by the grower. Assuming a much lower price for the article (not necessarily the case if we grow our best varieties), it is still safe to conclude that cotton, being what Americans call 'a sure crop,' will grow in favour according to the interest taken in the subject by the State and Federal authorities, to whom this industry should appeal as one of the most important of rural pursuits."

ONION GROWING.

TESTS DURING SEASON 1920 IN THE ROCKHAMPTON DISTRICT.

Mr. G. B. Brooks, Instructor in Agriculture, Rockhampton, has furnished the following report to the Department of Agriculture and Stock, detailing the results of onion-growing experiments on plots established for the purpose, one on the farm of Mr. E. A. G. Barnard, Deeford, Dawson Valley, and the other on the farm of Mr. T. C. Selerup, Scrubby Creek, Gracemere:—

"The soil on which the onions were grown at Deeford was a brown friable loam, originally covered with brigalow scrub. At Gracemere it consisted of a brown alluvial loam, also scrub land.

"The varieties tested were as follows:—Hunter River Brown Spanish, Extra Early Barletta, Brown Globe, and Yellow Danvers.

"Planting was carried out at both centres during the first week in May. A good germination was secured.

"Climatic conditions were adverse in the Dawson Valley during the winter months, the light showers that fell being of little benefit to the crop. As a result of the early summer rains, the crop recovered wonderfully, making fair growth. It was intended to harvest the varieties about the middle of January, but a heat wave, followed by wet weather, induced a fresh growth of tops to take place, making the crop unsuitable for market purposes.

"The crop at Gracemere made very good headway until September, when it was checked by a dry spell. Mr. Selerup, who was irrigating a field of potatoes alongside the onion plot at this time, turned the water on to the varieties, with the result that practically all the bulbs quartered, forming four separate onions. Although the bulbs remained sound after splitting, this occurrence spoiled what would otherwise have been an excellent sample.

"All varieties were harvested during the second week in January, the returns being as follows:—

Hunter River Early Brown Spanish	14 tons per acre.
Extra Early Barletta	11.9 tons per acre.
Yellow Danvers	9.2 tons per acre.
Brown Globe	9.1 tons per acre.

"The 'Hunter River Brown Spanish' were the best in regard to quality, followed by the 'Brown Globe.' The 'Yellow Danvers' were somewhat thick in the neck, the 'Barletta' being very faulty in this respect.

"The results obtained from the above, and previous tests carried out, go to show that, by adopting up-to-date methods in regard to the conservation of moisture, and ridding the soil of weed seeds, conditions in Central Queensland are suitable to the raising of onions as a paying farm crop."

WINTER FODDER DEMONSTRATION TESTS.

During the past season these tests were carried out in the Rockhampton district, under the supervision of the local Instructor in Agriculture, Mr. G. B. Brooks, whose report thereon is as follows:—

"The location of the plots, together with the names of the farmers in conjunction with whom the tests were conducted, are as follows:—

A. Collins, Marlborough;

S. Larson, Miriam Vale;

J. G. Hales, Rosedale;

W. Hunt, Milyando, Alton Downs; and

J. Arniel, Dululu, Dawson Valley.

"At Marlborough and Miriam Vale, the soil on which the crops were grown was an alluvial loam. At Rosedale and Dululu the soil was somewhat irregular—varying from a brown loam to a greyish clay; while at Alton Downs the land was of a heavy black basaltic character.

"In regard to rainfall, this varied very considerably in the respective localities. At Marlborough, although sufficient for the production of grain, it was barely enough for a crop grown for fodder purposes. The wheat varieties, as will be seen from the accompanying photo., made a remarkable even growth, and had they been harvested for grain, an excellent return would have been secured. At Miriam Vale, climatic conditions were exceedingly favourable, several of the varieties lodging in places. At Rosedale the rainfall was equally satisfactory.

"The plot at Dululu was ploughed to a depth of some 12 inches, and again cross-ploughed shortly before sowing, on both occasions during very dry conditions. When the crop was put in there was practically no moisture in the soil, but a few light showers fell shortly after, inducing germination. Later, a heavy downpour of rain was experienced, unfortunately of very short duration, which saturated the depressions, the result being that the crop only developed in patches. While some portions were 3 ft. high, others were only 6 inches. As the grower was short of the necessary feed to keep his dairy herd alive, permission was given to graze the crop off.

"At Alton Downs, conditions were somewhat similar to the Dawson Valley, the rain that fell during the growing period not being sufficient to saturate the soil. As will be noted from the attached list of weights, the returns from all varieties on this plot were poor.

CONCLUSIONS.

"The tests carried out during the past three seasons have demonstrated that under Central Queensland conditions certain varieties of wheat are much superior to Algerian oats, both as a fodder and hay crop. Under dry conditions, Algerian oats are too backward; while, given a plentiful supply of moisture, they are subject to rust. The Ruakura oat is a decided improvement over the Algerian, in that it is not so susceptible to rust, so far only a trace appearing in the crop. The only drawback in growing this variety has been the difficulty in procuring seed.

"Canary seed has not come up to expectations as a fodder crop. The only satisfactory yield so far secured in the numerous tests carried out was at Rosedale, where a fine crop of succulent material was produced and converted into hay.

"Field pea and wheat have proved an excellent combination for fodder purposes, and one that should be more largely grown.

"Of the five varieties of wheat embraced in the tests this season, Florence appears to be the general favourite, this being due, in a large measure, to its early maturing habit and its fine even growth. 'Warden's Hay' and 'Cleveland' showed traces of rust.

"The objective aimed at in carrying out the above tests was to demonstrate that by sowing at one time certain varieties of crops, a continuous supply of fodder can be maintained throughout the winter months for dairy stock, &c. It is pleasing to report that in this respect the results obtained were most satisfactory. The order in which they became available for use was as follows:—First 'Skinless Barley,' closely followed by the 'Cape' variety. Then 'Florence' wheat, together with the Field Pea mixture. Next in order were 'Piastre,' 'Warden's Hay,' 'Indian Pearl,' and 'Cleveland' wheats. Ruakura oats followed—the Algerian failing on account of rust.

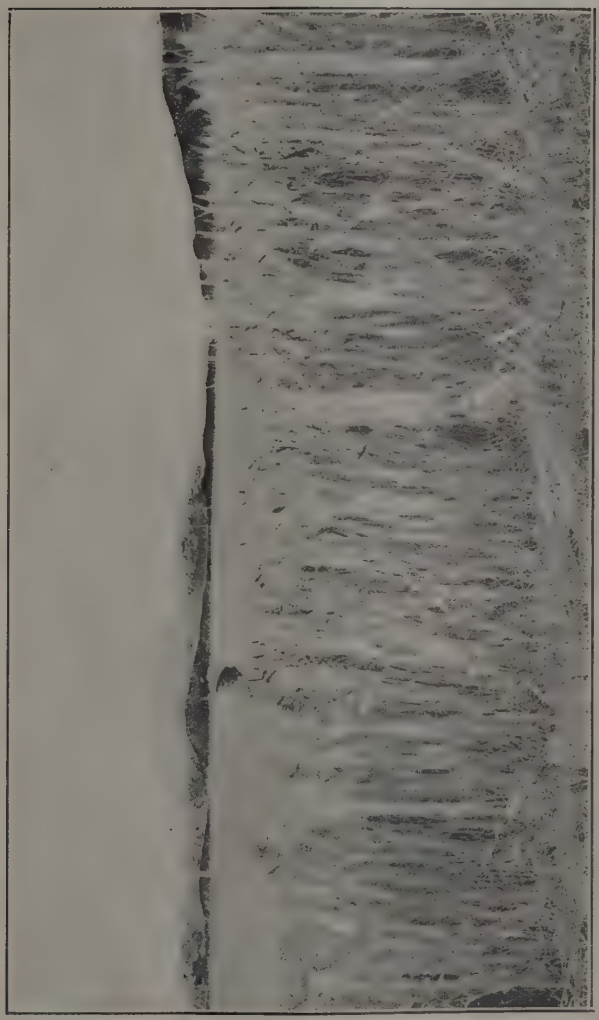

Plate 10.—Demonstration of Winter Fodder Crops on the Farm of Mr. S. Larsen, Miriam Vale. Cleveland Wheat.

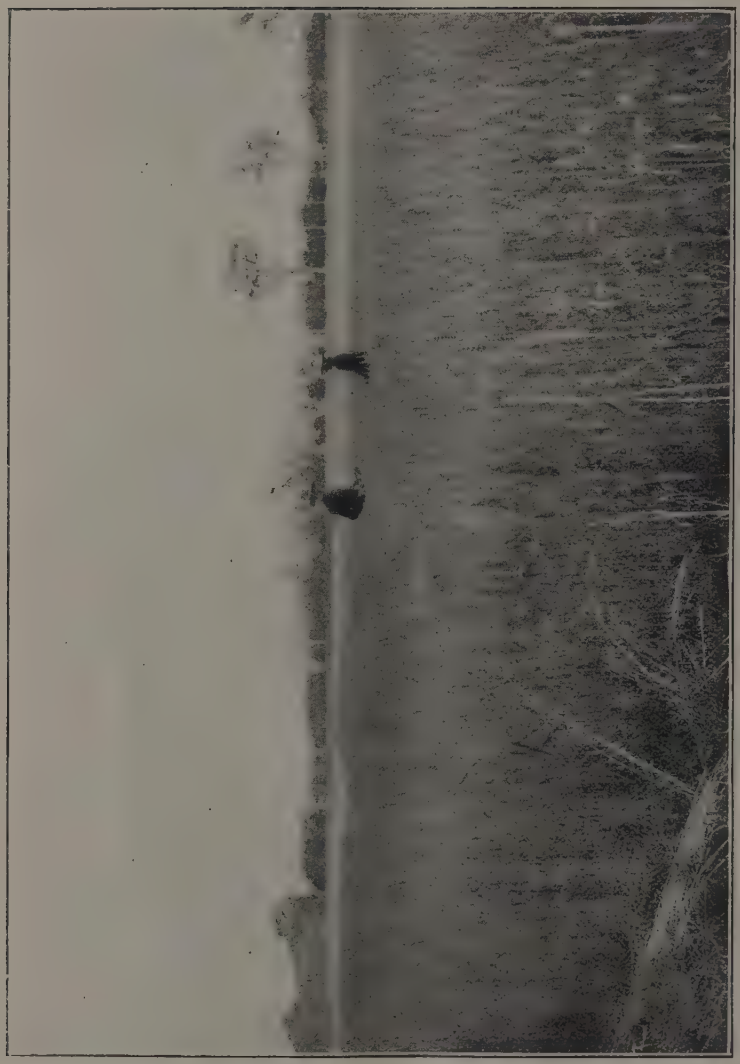

PLATE 11.—THE FODDER CROP OF FLORENCE WHEAT ON MR. A. COLLINS'S FARM, MARLBOROUGH.

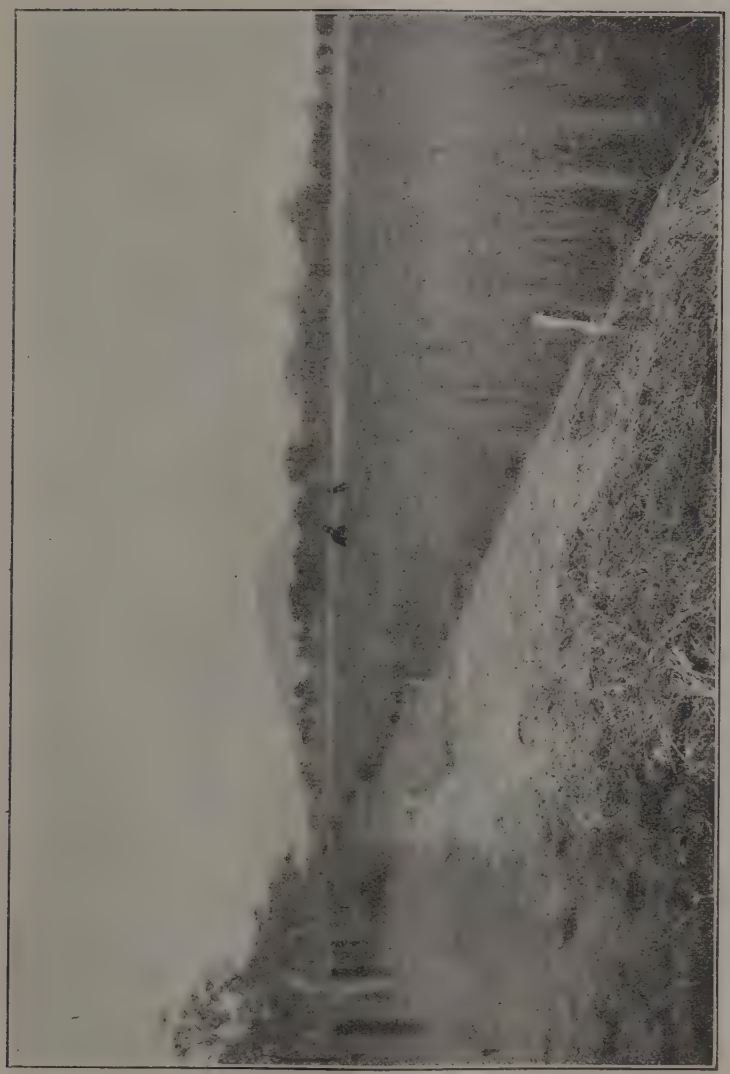

PLATE 12.—GENERAL VIEW OF FLORENCE WHEAT CROP AT MARLBOROUGH.

PLATE 13.—CROP OF FLORENCE WHEAT ON MR. LARSEN'S FARM, MIRIAM VALE.

"The tests carried out created a large amount of interest in the districts in which they were located, the plots being visited by numerous farmers, many of whom travelled a considerable distance to do so.

"The yields obtained at the respective centres are attached herewith.

"G. B. BROOKS,
"Instructor in Agriculture."

CENTRAL DISTRICT.

WINTER FODDER DEMONSTRATION PLOTS, SEASON 1920.

RESULTS SHOWING YIELDS IN TONS PER ACRE (GREEN WEIGHT).

Variety.	S. Larson, Miriam Vale.	J. C. Hales, Rosedale.	A. Collins, Marlborough	W. Hunt, Milyando.	Average.
	Tons.	Tons.	Tons.	Tons.	Tons.
Skinless Barley	14·7	9·1	11 0	5·5	11·6
Field Peas and Wheat ..	12 9	10·0	11 5	5·6	11·4
Cape Barley	10 2	14·0	9·4	6·9	11·2
Ruakura Oats	15 6	7·4	10·8	6·1	11·2
Florence Wheat	12 3	8·5	11·0	5·3	10·6
Indian Pearl Wheat ..	12·8	10 6	9·5	..	10·9
Warden's Hay Wheat ..	13·2	6·5	11·2	..	10·3
Piastre Wheat	13·2	7·3	11·1	6·1	10·2
Cleveland Wheat	12·1	6 9	10·3	4·8	9·8
Algerian Oats	Rusted	5·5	Rusted	4·0	4·7
Canary Seed	Failed	20·0	Failed	Failed	..

TREATMENT OF FISTULA.

By A. H. CORY, M.R.C.V.S., Chief Inspector of Stock, Department of Agriculture and Stock, Queensland.

When a fistula on withers is forming, it is customary to apply a blister, or hot fomentations. This on rare occasions appears to effect a cure, but in the majority of cases it hastens the swelling and brings it to a head. After it has broken, surgical treatment is required.

The next thing to find out is the direction and depth of the fistula. This is done by using a flexible probe, some 8 or 9 inches in length. Free drainage must now be given by opening along the full length of the probe, or if thought advisable an opening can be made at the lower part of probe, and a seton or tape or other material passed through and tied on the outside. A seton keeps the wound open and assists in draining the cavity, but the first method of opening up is generally found more satisfactory. Both sides of the withers should be opened if necessary, and any necrosed (dead) tissue removed. The top of withers should not be opened crossways—from side to side—because there is a ligament which runs along the middle line of shoulders from the head—if cut causes serious consequences.

The chief points to remember are: Free drainage, the removal of all dead tissue, and the prevention of pockets where pus can accumulate.

The following lotion should be used every third day on the fistula after it has been opened up, until four applications have been applied:—

Corrosive sublimate	½ oz.
Methylated spirit	1 pint.

This is best applied by soaking some cotton wool or other absorbent material with the lotion, then packing the saturated cotton wool in the fistula. This treatment can be repeated if necessary after 10 or 14 days' interval. Knives, probes, &c., should be thoroughly disinfected before using by placing them in boiling water, or some disinfectant such as carbolic acid, Condy's fluid, &c. Knives and other steel instruments should not be allowed to come in contact with the corrosive sublimate solution.

Pastoral.

A NEW CURE FOR FOOT AND MOUTH DISEASE.

A cable from Paris to the Brisbane "Daily Mail" lately stated that successful experiments have been made with a new vaccine discovered by Dr. Cepedo, which is claimed to cure foot and mouth disease in four days. Dr. Cepedo considers that the infection is of a streptococcic nature, and he hopes the new treatment will replace serum injections. The highest importance is attached to the discovery in view of the fact that the disease cost Europe over 1,200,000,000 francs since 1918.

On the subject of this disease, we have received a most exhaustive account of its ravages and the remedies to be adopted, in an article in "The Popular Journal," entitled "La Fiévre Aphteuse" (Geneva). The following is a translation of that portion of the article pointing out what should be done in case the disease should make its appearance:—

Instead of encouraging the propagation of the disease by smearing the mucous membrane of each animal with the mucous; instead of administering purgatives as recommended by one person, or drastics advised by another; and instead of applying antiseptics more or less factitious, the following treatment should be adopted:—Help the elimination of the toxic matter by draining the cellular centres. Induce the defensive reaction of the organism by striving to minimise it by restoring demineralised cell by recalcinating it. After many years of incessant experimentalising, a scientific remedy has been discovered, which is absolutely efficacious and practical for preventing and curing foot and mouth disease. The anti-fever remedy which we present under the name of "Zeol" is an isopathic specific containing mild toxins. It retains its properties for an indefinite period, and undergoes no change at a temperature up to 60 degrees F.

This remedy contains no toxic substance. It may, therefore, be injected without any injurious result; of itself it is absolutely harmless.

Recent experiments have proved that animals affected by the disease which have been healed with Zeol and Aftolin have been cured in a few days. Further, that no cow, goat, or sheep has miscarried or lost its calf or lamb; that the diminution of milk amongst females attacked has only continued for a few days, and has again become normal in a week after treatment.

That, thanks to Aftolin, the sores and swelling never become spreading, deep, or painful, because from the moment they are combated they cicatrise and rapidly disappear, and the animals treated preventively have become immune.

We also find further information, apparently confirmatory of the discovery of a rapid vaccine cure for the disease, in the "Journal de la Seciété Nationale des Agriculteurs de Belgique." Following is a note received by the above journal on this important discovery, from Mr. Belin, Director of the Biological Institute of Tours, France:—

"Mr. Belin is not unknown in the scientific world, in which on many occasions he has signalised himself by successful new discoveries. Furthermore, the results which he has published are not merely those of the laboratory, which are so often illusive when applied in practice, nor even the outcome of a few successful experiments, but they are those proved by clinical facts, recorded in various places, and watched by veterinary surgeons.

"VACCINATION AGAINST FOOT AND MOUTH DISEASE.

"Up to the present it was said to be impossible to find a vaccine which would combat the disease and prove a protection against it for the animals, resulting in immunity. All experiments so far have been unsuccessful, and those following the tracks of serotherapy have not resulted in anything better. Nevertheless, this vaccination is reliable. It can be accomplished; such is the plain fact, resulting from the experiments made by me at the Bacteriological Institute of Tours, and from its practical application carried out for some months on 60,000 cattle and pigs, and that in all parts of France.

"Furthermore, the vaccine employed is prepared in such a manner that, being injected into sick beasts, it effects a rapid and complete cure. I cannot now enlarge upon all the successes realised, and must be satisfied with enlarging somewhat on

two of them, which may serve as typical—one from the preventive, the other from the curative point of view—because they have been proven on a large number of cattle, and because they have been perfectly carried out and diagnosed. I will now indicate briefly some results obtained elsewhere.

"*Preventive Measures.*—In June and July the mortality amongst adult cattle in certain districts of Calvados amounted to 30 per cent., and in the case of calves to 80 per cent. It was under these extremely rigorous conditions that Mr. Amiat, veterinary surgeon at Fleury-Harcourt, applied my method of vaccination. The results were, as stated by him: 'I have vaccinated 1,400 cattle for prevention of an attack. Only 100 had the fever, and that in a mild form. None of the vaccinated animals which were not breeding showed any lesion, notwithstanding their proximity to the sick ones. A great number of those treated totally escaped infection. Amongst the adults the mortality fell from 30 per cent. to nil, and from 80 per cent. to 10 per cent. amongst the calves. By this means mammiferous foot and mouth disease is totally avoided. One hundred pigs have been vaccinated, and some of them accidentally drank some infected milk, but not one of them became infected.'

"It would be difficult to establish more clearly the existence of such an immunity as one could possibly desire.

"Everywhere in France the most reliable results have been attained, and well-known veterinary surgeons who have operated with this serum are mentioned as being loud in their praises of it.

"*Curative Measures.*—What may be expected from this vaccine in effecting cures of sick animals by its application on a large scale is clearly shown by Mr. Colin, veterinary surgeon (Mayenne). He treated 354 cattle, of which 99 were calves, with the curative serum. Out of all these, one cow died, and seven sucking calves. The rest of them recovered without any further treatment beyond two doses on the first day and one dose four days later."

The article of which the above is an extract gives several other instances of cures effected by this vaccine, where any other treatment has failed.

MOLASSES AS A FUEL.

The investigations of G. E. C. von Stietz into the possibilities of using molasses as a fuel in sugar factories have been described in *Arch: Suikerind*: 28, 1920. The main results are summarised in "Chemical Abstracts," August, 1920, and are briefly as follows:—

The burning of molasses mixed with megass does not give good results, because of the formation of a slag which chokes the furnace grates and prevents proper combustion. The potassium compounds present in the molasses, moreover, exist in an insoluble form in this slag, so that its value as a fertiliser is greatly reduced. If molasses is burnt alone, much furnace space must be provided because of the large amount of foam produced and the great bulk of carbon liberated.

The only way to use molasses by itself as a fuel is to preheat it so as to bring about carbonisation. A process is now being perfected in which the burning can be so regulated that either a dry char containing about 40 per cent. of ash, or a pure white ash is left. The ash amounts to 7 to 12 per cent. of the molasses. It is soluble in water to the extent of 15 to 30 per cent., and contains 30 to 50 per cent. of potassium oxide. The chief soluble potassium compounds actually present in it are the carbonate, the sulphate, the chloride, and the silicate. It would be a difficult matter to separate these compounds by fractional crystallisation because their solubilities are so nearly alike. Various methods, however, have been devised for their isolation and purification in chemical plants worked in conjunction with large sugar factories. Only 20 per cent. of the heat produced by burning molasses is needed in the manufacture of the potassium salts, the remaining heat being available for utilisation in the sugar factory.

Besides potassium compounds, the ash of burnt molasses contains compounds of calcium, magnesium, iron, and sodium. These include chlorides, phosphates, and silicates of the metals named. A part of the potassium compounds, and all of the compounds of calcium and magnesium, and also silica are quite insoluble.

The increasing importance of preventing all possible waste in the modern sugar factory should be a sufficient reason to cause sugar technologists to give serious attention to the results of investigations such as the above, and it is hoped that some method of utilising molasses in the way suggested will eventually be adopted in many of our large West Indian sugar factories.—"Agriculture News," Barbados.

Poultry.

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JANUARY, 1921.

The weather during January was appreciated by the birds. Nice showers and cooler weather were inducements to brace up, and the laying for the month was satisfactory, especially in the light section. During the last ten days the increased output was very noticeable. Constant broodiness is what cripples the tally of the heavy breeds at this time of year, and every care is taken to immediately place broodies in coops, as it takes so little to bring on a moult. Very few birds are moulting, and those doing so are mostly laying as well. Featherless heads are much in evidence now, and the majority have that hard, tight appearance that utility breeders like to see at this season of the year. The birds are eating splendidly. T. Hindley's "A" Black Orpington died from ovarian trouble, and Mrs. Kettle's Black Orpington in group pen from tuberculosis. The following are the individual records: —

Competitors.	Breed.	Jan.	Total.
LIGHT BREEDS.			
*Geo. Trapp	White Leghorns ...	123	1,302
*Haden Poultry Farm	Do.	112	1,285
*O. W. J. Whitman	Do.	128	1,284
*J. M. Manson	Do.	118	1,246
*J. Newton	Do.	115	1,245
*Quinn's Post Poultry Farm	Do.	119	1,243
*N. A. Singer	Do.	128	1,236
*J. J. Davies	Do.	115	1,235
Geo. Lawson	Do.	106	1,233
*Dr. E. C. Jennings	Do.	125	1,232
*W. Becker	Do.	125	1,229
*L. G. Innes	Do.	132	1,218
Mrs. R. Hodge	Do.	138	1,204
*E. A. Smith	Do.	125	1,195
*T. Fanning	Do.	115	1,195
*J. H. Jones	Do.	111	1,171
*G. Williams	Do.	104	1,167
*H. Fraser	Do.	104	1,158
*W. and G. W. Hindes	Do.	111	1,156
*Mrs. L. Anderson	Do.	110	1,147
*B. Chester	Do.	111	1,140
*Thos. Taylor	Do.	125	1,134

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Dec.	Total.
LIGHT BREEDS—*continued.*			
*Mrs. L. Henderson	White Leghorns	113	1,117
S. L. Grenier	Do.	106	1,115
*S. McPherson	Do.	89	1,111
Thos. Eyre	Do.	114	1,092
*Range Poultry Farm	Do.	99	1,083
E. Chester	Do.	116	1,051
*S. W. Rooney	Do.	83	1,041
Avondale Poultry Farm	Do.	101	1,026
H. P. Clarke	Do.	113	1,018
C. Langbecker	Do.	117	1,012
S. Chapman	Do.	116	1,008
R. C. J. Turner	Do.	109	1,005
W. Morrissey	Do.	102	1,003
C. M. Pickering	Do.	113	981
H. A. Mason	Do.	125	980
C. H. Towers	Do.	100	945
C. A. Goos	Do.	110	926
W. D. Evans	Do.	73	919
A. J. Anderssen	Do.	82	900
Miss E. M. Ellis	Do.	Withdrawn	583
HEAVY BREEDS.			
*R. Burns	Black Orpingtons	115	1,264
*A. Shanks	Do.	128	1,254
*E. F. Dennis	Do.	99	1,241
*R. Holmes	Do.	95	1,218
*A. Gaydon	Do.	113	1,187
*E. Morris	Do.	103	1,180
*D. Fulton	Do.	92	1,159
*J. Cornwell	Do.	110	1,127
H. M. Chaille	Do.	95	1,113
*W. Smith	Do.	84	1,109
*A. E. Walters	Do.	87	1,100
*E. Oakes	Do.	92	1,094
*T. Hindley	Do.	86	1,061
*R. B. Sparrow	Do.	107	1,058
Parisian Poultry Farm	Do.	101	1,053
Mrs. G. H. Kettle	Do.	112	1,049
J. E. Smith	Do.	97	1,049
R. C. Cole	Do.	97	1,015
G. Muir	Do.	110	1,012
*E. Stephenson	Do.	100	951
*J. E. Ferguson	Chinese Langshans	100	947
*Nobby Poultry Farm	Black Orpingtons	80	927
G. Flugge	Do.	97	840
Total		6,882	71,569

* Indicates that the pen is being single tested.

RESULTS OF SINGLE PEN TESTS.

Competitors.	A.	B.	C	D.	E.	F.	Total.
LIGHT BREEDS.							
G. Trapp	223	218	233	203	223	202	1,302
Haden Poultry Farm	235	172	236	228	202	212	1,285
O. W. J. Whitman	205	201	235	216	193	234	1,284
J. M. Manson	191	216	225	215	206	193	1,246
J. Newton	229	201	217	153	222	223	1,245
Quinn's Post Poultry Farm	233	213	214	193	183	207	1,243
N. A. Singer	213	186	205	235	204	193	1,236
J. J. Davies	220	210	211	187	210	197	1,235
Dr. Jennings	164	235	194	193	210	236	1,232
W. Becker	217	207	225	203	178	199	1,229
L. G. Innes	158	201	213	226	226	194	1,218
E. A. Smith	201	170	219	196	199	210	1,195
T. Fanning	99	213	209	218	228	218	1,185
J. H. Jones	195	191	202	211	199	173	1,171
G. Williams	181	199	203	196	219	169	1,167
H. Fraser	150	199	212	208	204	185	1,158
W. and G. W. Hindes	177	202	169	210	198	200	1,156
Mrs Anderson	223	208	203	183	160	170	1,147
B. Chester	199	171	205	186	198	181	1,140
Thos. Taylor	215	195	158	207	182	177	1,134
Mrs. Henderson	164	187	197	179	204	186	1,117
S. McPherson	223	225	91	137	231	204	1,111
Range Poultry Farm	131	174	197	217	177	187	1,083
S. W. Rooney	153	158	202	148	186	194	1,041
HEAVY BREEDS.							
R. Burns	212	197	241	190	216	208	1,264
A. Shanks	177	223	196	247	174	237	1,254
E. F. Dennis	226	197	184	231	192	211	1,241
R. Holmes	189	206	204	200	219	200	1,218
A. Gaydon	195	244	201	169	160	218	1,187
E. Morris	203	198	206	164	207	202	1,180
D. Fulton	206	206	186	216	92	253	1,159
J. Cornwell	193	211	197	129	182	215	1,127
W. Smith	110	222	204	205	188	180	1,109
A. E. Walters	172	183	167	207	160	211	1,100
E. Oakes	173	223	177	102	201	218	1,094
T. Hindley	192	216	179	174	136	164	1,061
R. B. Sparrow	197	123	197	171	164	206	1,058
E. Stephenson	184	147	182	168	140	130	951
J. E. Ferguson	130	161	123	161	203	169	947
Nobby Poultry Farm	184	238	83	250	152	20	927

CUTHBERT POTTS,
Principal.

THE SICILIAN BUTTERCUP.

Sicily is the largest island in the Mediterranean and it belongs to Italy. Palermo is the capital and is a seaport, beautifully situated on the northern shore, surrounded by a fertile plain and enclosed by lofty hills. It was in a village just south of Palermo that some fifty years ago an Italian, Lorenzo Mattei, had a uniform flock of these fowls. An American in diplomatic service, James S. Dumaresq, chanced to see them and they appealed to him, not only on account of the large white eggs they laid, but because the little buff chicks with a brown stripe down their backs reminded him of American chipmunks. He was enthusiastic and enjoyed breeding the Sicilian Buttercups at his summer home in Italy. When

he returned to America he took an important part in introducing the Sicilian fowls. The breed took its name from the peculiar shape of the comb, the cup-shaped formation of which suggested a buttercup.

An advance is now being made in the general quality of the Buttercups. The comb characteristic, the clear breast in the female, and the sound red and black colour in the male, are features that are being perfected through selective breeding. The stock as we now have it is the foundation upon which to build the superstructure, it is the proper material for the breeder to take in hand to mould. It is useless to go back to the original source for further material, for on the island the peasants have made no attempt to maintain the essential characteristics of the breed. The question now is one of cultivation, of breeding to a high ideal.

Coming from the island of Sicily, in the Mediterranean, one might reasonably expect that the Buttercup should have a white lobe. All the other Mediterranean breeds have white earlobes, solid red disqualifying. We have seen Buttercup hens and pullets with earlobes that were all white, but the standard states the red should predominate in the earlobe, with the least possible admission of white. The red lobe is a race characteristic of the Asiatic breeds, the Leghorn, Andalusian, Ancona, Minorca, &c., which came from the shores of the Mediterranean, having white earlobes. That old Roman fowl, the Dorking, had white lobes until the infusion of Asiatic blood was made by English breeders. It is this unmistakable Asiatic blood that gives the Buttercup its comparatively docile nature. In the writings of breeders of the fowl we have noticed again and again reference to the fact of its tractability.

From the colour of its plumage one may see that the Buttercup is by nature a pencilled fowl. Judges may compare the colour of the male with that of the Golden-pencilled Hamburg male, but the colour of the hen is buff, not golden hay, and she is plain in breast and pencilled only on the back and wing bow. She presents a considerable contrast to the deep red colour of the male. The pencilling of the female's feathers is somewhat similar to that of the golden-pencilled Hamburg, but the black bar running across the feathers is usually broken in the centre. Each feather on the back and wing bow should have a crescentic tip of black. This adds uniqueness to the pattern of the feathering. The comb is the distinctive feature of the Buttercup. Its general form is concave or cup shaped, and all the way round it spreads out into points. The comb is divided into two parts, half circles that are joined at the base. In this centre extraneous growths are frequently found, also points that stand up like the stamens of a flower. These are not desirable. The combs of the Buttercups in the illustrations are smooth in the centre and practically ideal. Single combs that are merely split into two blades, being imperfect in the development of the corolla, are often found in the females. Such are usually too large and loose, frequently lopping, hence are decidedly objectionable.

The following is the standard which has been finally adopted:—Weight of cock, 5 to 6 lb.; weight of hen, 4 to 5 lb. These weights are low, the majority of specimens in both sexes being at least one or two pounds heavier. The head should be fairly broad, eye a bright hay, beak of moderate length and dark horn in colour. Neck of medium length, furnished with a full flowing hackle. Body long and oblong in shape, breast deep and fairly full and well rounded; back of moderate width, sloping and narrowing slightly towards the tail. Tail large and well furnished, and carried at an angle of about 45 degrees. In the cock the sickle feathers should be long and the tail well feathered with side hangers. Shanks should be willowy green and of only medium length; four toes only on each foot. Thighs comparatively short, set well apart and at about the middle of the body. Colour of male—Tail sickles and coverts a glossy black; flights black and brown, rest of the birds a deep red. Colour of female—Neck, golden buff; breast a light shade of buff, free from black markings. Back and wing bows light buff with black markings. Under colour in both sexes, slaty colour.—"Garden and Field," Adelaide, S.A.

The Orchard.

GRAFTING THE PAPAW.

Referring to a note on "Grafting the Papaw" which we published in the January issue of the Journal, a correspondent of "Nickos," 15th January, who evidently believes that it cannot be done, is informed that it can and has been done successfully. The following is the method adopted in India, Jamaica, and elsewhere. The question has been decided in the affirmative by well-known scientific experimentors in the countries named:—

The usual method of propagating the papaw in Queensland is from seeds, but it has been shown that propagation by cuttings and by grafting is possible, and has been successfully done in India and in Jamaica.

The method of grafting the papaw is so extremely simple that it seems remarkable that it was not discovered earlier than in 1913. The writer discovered it before hearing of the successes achieved in the United States, and in the countries abovementioned. The grafted tree made astonishing growth.

The method adopted was as follows:—

The first difficulty lay in the fact that a bearing papaw tree under ordinary circumstances does not normally produce side-shoots which can be used for grafting. It has long been observed, however, that if the top of a bearing tree is cut, or broken off by accident, a large number of shoots begin to form, one from the upper part of each leaf scar—that is, the axil of the leaf. This takes place three or four weeks after the tree is decapitated. It is these small shoots, of which as many as fifty or more may be produced by a single tree, that are used in grafting the papaw.

One of these shoots is taken when a few inches long and about the diameter of a lead-pencil, is sharpened to a wedge point, the leaf-surface reduced, and then inserted in a cleft in a young seedling papaw plant which has been decapitated when 6 to 10 inches high, and split with a very sharp, thin, grafting knife. At this stage the trunk of the young seedling has not yet formed the hollow space in the centre. It is not necessary for the stock and the scion to be of equal size; the scion should not, however, be larger than the stock.

After inserting the scion, the stock is tied firmly, but not tightly, with a short piece of soft twine. The grafted plant should be shaded for a few days after the grafting has been done, and the twine should be removed on the sixth or seventh day. The best success has been secured by grafting potted seedlings in the bush-house or under the shade of a bath-house. Under these conditions fully 75 per cent. of success can be expected. The method has also been successfully followed in the field.

The Director of Fruit Culture, Mr. A. H. Benson, is, however, of the opinion that the grafting of the papaw would not be commercially profitable.—A. J. BOYD.

THE BANANA INDUSTRY: BUNCHY-TOP.

The Tweed River has long been noted for the excellence of its bananas, which always meet with a ready sale in the Southern States, and the advent of the disease known as "bunchy top" caused growers in the district much alarm as to its possible effects. In the "Farmer and Settler," Sydney (Jan. 28), we read that experiments have recently been conducted by Mr. T. Brooks, of Highfields, Tweed Heads, in an effort to discover a cure for this disease of the banana.

The Assistant Fruit Expert at Murwillumbah (Mr. R. G. Bartlett) visited Mr. Brooks's farm lately, and expressed himself as being much impressed with what he saw. The treatment was first commenced on 21st December, and Mr. Bartlett is very hopeful that a preventive, if not a cure, has been found for this disease.

Mr. Brooks does not claim to cure "bunchy-top" when it has been long established, the treatment applying chiefly to newly planted suckers.

Mr. Bartlett states that after he visited Mr. Brooks's farm he inspected an area in which experiments were being conducted by another grower in a different district. The same chemical was being used, though in lesser quantities, but the results obtained by Mr. Brooks were corroborated.

Mr. Brooks intends to give the growers the benefit of his experience.

On this subject, the Brisbane "Daily Mail" writes:—

"If the new sulphur treatment, announced by Mr. T. Brooks, for ridding banana trees of the bunchy top pest, should ultimately prove to be generally efficacious, it may mean the saving of a great Australian industry. It has been stated that, failing some such cure, it could only be a matter of two or three years before all our banana plantations were utterly destroyed. Mr. Brooks, who as a banana grower, has himself experienced the bunchy top menace, believes that he has at last found a way to stop its alarming depredations. Having experimentally ascertained that bunchy top was caused by the action of a certain fungus which parasitically dwelt at the banana roots and thus starved the whole tree, his next problem was to discover a germicide that would scotch the parasite without injuring the tree. He found that sulphur would exterminate any fungi; and so rapid and radical was its curative action upon the diseased banana plant that, a couple of days after it had been rubbed into the bulb, the yellow of the sulphur was visible in the top leaves. It is, of course, difficult to cure an old plant; and his advice in that case is to knock out the old tree, treat the hole, and then let the healthy suckers come on. It is to be hoped that the Department will follow up this bit of private research, and, by testing the scheme in various districts, find out to what extent it is a reliable remedy."

CANARY SEED.

MARKETING PROBLEM.

On 31st December a meeting of canary seed growers was held in the Nobby School of Arts. In addition to a large attendance of local growers, representatives were present from Pittsworth, Broxburn, Felton, and Greenmount, and Messrs. J. H. Cecil Roberts, M.L.A., and H. M. Hart, of the Wheat Board.

Mr. D. R. Edwards, who presided, mentioned that he had had a large number of letters from different centres, including Tamworth, N.S.W., all commending the movement for reasonable price for canary seed. He had interviewed Mr. Morgan, chairman of the Queensland Wheat Pool, and Mr. Morgan, whilst in Melbourne, had placed the matter before the Federal authorities and had been successful in securing considerable information. He had considerable information from Southern buyers which pointed to the determination of the buyers not to purchase to any great extent at the present time, as the position appeared critical. There were stocks in hand, sufficient at the present time at least, which had cost somewhere in the vicinity of £65 a ton. After these stocks had been disposed of the buyers would then operate at as low a price as possible, and would then average up their operations at the cost of the growers. Financial stringency was going to play a big part in the buying of the crop. The idea seemed to be prevalent that a very heavy crop was being harvested. He, however, thought the crop most disappointing and not nearly as heavy as anticipated. Correspondence from large firms in Melbourne, Sydney, and elsewhere showed a desire to get the farmer to mention a price at which he would sell. He advised growers to make an effort to fix a price based at such a figure as to be a payable proposition.

Letters were read from New South Wales advising farmers to hold on to their crops until February, by which time the high-priced canary seed would in all probability have been disposed of. Some co-operative method of selling must be evolved either through a compulsory or voluntary pool.

The most difficult question was finance, but, like all other difficulties, this would have to be faced and overcome.

The chairman then announced a scheme for the meeting to consider. The meeting was asked to form an executive committee to deal with the situation. This suggestion was adopted, and the following were appointed an executive committee:—Messrs. Edwards (Nobby), Fitzgerald (Felton), Denning (Pittsworth), Hogg (Greenmount), and Cornford (Broxburn).

The scheme provided for taking immediate steps to ascertain as near as possible the stocks held, the crop available, and the requirements for twelve months. This would enable the committee to decide upon what amount of seed, if any, was available for export. Steps would then be taken towards the formation of a pool to deal with the matter co-operatively.

The cost of pooling was important. In a subsequent discussion on this matter the chairman pointed out that farmers did not realise that the speculators who financed and buyers who handled crops did so at an actual indirect cost, which was far in excess of what any ordinary pool would cost.

Steps are now being taken to secure the necessary information with a view of enabling growers to take concerted action in their own interests instead of, as in the past, selling one against another.—"Daily Mail."

Apiculture.

GENERAL INFORMATION AND HINTS TO AMATEURS ABOUT TO START BEEKEEPING.

By W. F. LYON.

So many requests have been received by the Queensland Beekeepers' Association for information as to how to start beekeeping and the initial cost, that the association came to the conclusion that it would be a good thing to have a pamphlet printed for the benefit of new beginners, and it was decided that Mr. W. F. Lyon approach the Department of Agriculture to see if they had any pamphlets printed for that purpose. On inquiry it was found that no such pamphlet had been issued by the Department.*

As I have had fifty-six years' experience in beekeeping, I should know enough about it to affirm that any person taking up beekeeping as a hobby would never regret it, provided he does not neglect the bees. The question of profit depends almost entirely on the knowledge, energy, and perseverance of the beekeeper. If he gives the bees proper attention, they can generally be depended upon to do their share of the work.

In the first place, I would say to the beginner: "Is your locality suitable for bees?" Don't think for a moment that bees make honey. They gather it, and if it does not grow within 2 miles of where you want to keep bees, I say do not attempt it, as it will be a failure. Don't think that a few flowers growing in your garden are sufficient to supply them, because they will not do so. You must be near a eucalyptus forest, or near a locality where there is plenty of lucerne grown. If any new beginner wants to start beekeeping for a livelihood, he should be very careful to start in a suitable place, as many have failed through neglect of this precaution. Always apply to an experienced beekeeper for advice before starting an apiary. My advice is to keep away from all scrubs and tea-tree swamps, as they produce a very inferior honey which will spoil the sale of your product. If you have not the means to buy a quantity of colonies to start with, be very careful how you increase your stock, or you will only be courting failure again. If the colonies are divided into two or three parts, they get down so low that they cannot recover themselves, and you are sure to lose the whole of them, unless you have other colonies to support them with honey and brood. To work a bar-frame hive for profit, it is first necessary that the beekeeper should exercise forethought and be prepared for any emergency that may arise. He should always have by him plenty of spare frames, foundation combs, and supers. It is very unprofitable to be short of these essentials during an unexpected honey flow. The man who wants to keep only one or two colonies will require one full colony of Italian bees with super all complete, one smoker, one wire embedder, ¼ lb. of spool tinned wire, and one bee-veil. These will cost about £4 10s. He should have an uncapping knife and honey extractor, but these are rather expensive items at the present time, and can be got later on. If you are living in a small space of ground, you must take care not to place the hive too close to the fowlyard or the stable, as the bees have a great aversion to horses and fowls, and do not put them in the garden where you turn the soil up. Do not place the hive in a low, damp place, for if you do so it will cause mildew in the combs and be very unhealthy for the bees.

When you buy your colony of bees, get the owner to pack them for removal, as it wants an experienced person to do this properly to prevent the bees from suffocating or getting out. Having got the bees home, place the hive on the stand where you intend to keep it. Pull all the strips off all the sides that are holding the hive together. Now be very careful when pulling the tacks out of the netting that is nailed over the entrance, and be sure you do not let any bees out until you have all the tacks drawn, then pull the entrance off and run (but there, I needn't tell you that).

The bees will be very angry now, so you must keep away for five minutes. Have your smoker charged with a little rotten wood if possible and a few live coals. If you have no rotten wood, use the very small chips in your wood heap. Note:—When you lift the cover off, do not lift it off quickly. If it is sealed down with propolis, take a chisel or knife and prise the cover up, sufficiently to break the seal. Then lift one end of the cover a few inches with one hand and blow a little smoke with the other. If you do this carefully you will never be stung by the bees on opening the hive. Be sure not to jar the hive in any way, as it makes the bees very angry.

Now choose the frame you are going to take out first. Push the frames on each side a little way so as to give more room to lift the selected frame out without crush-

* Exhaustive papers on the industry were published in the "Queensland Agricultural Journal" (vols. 1 to 19).

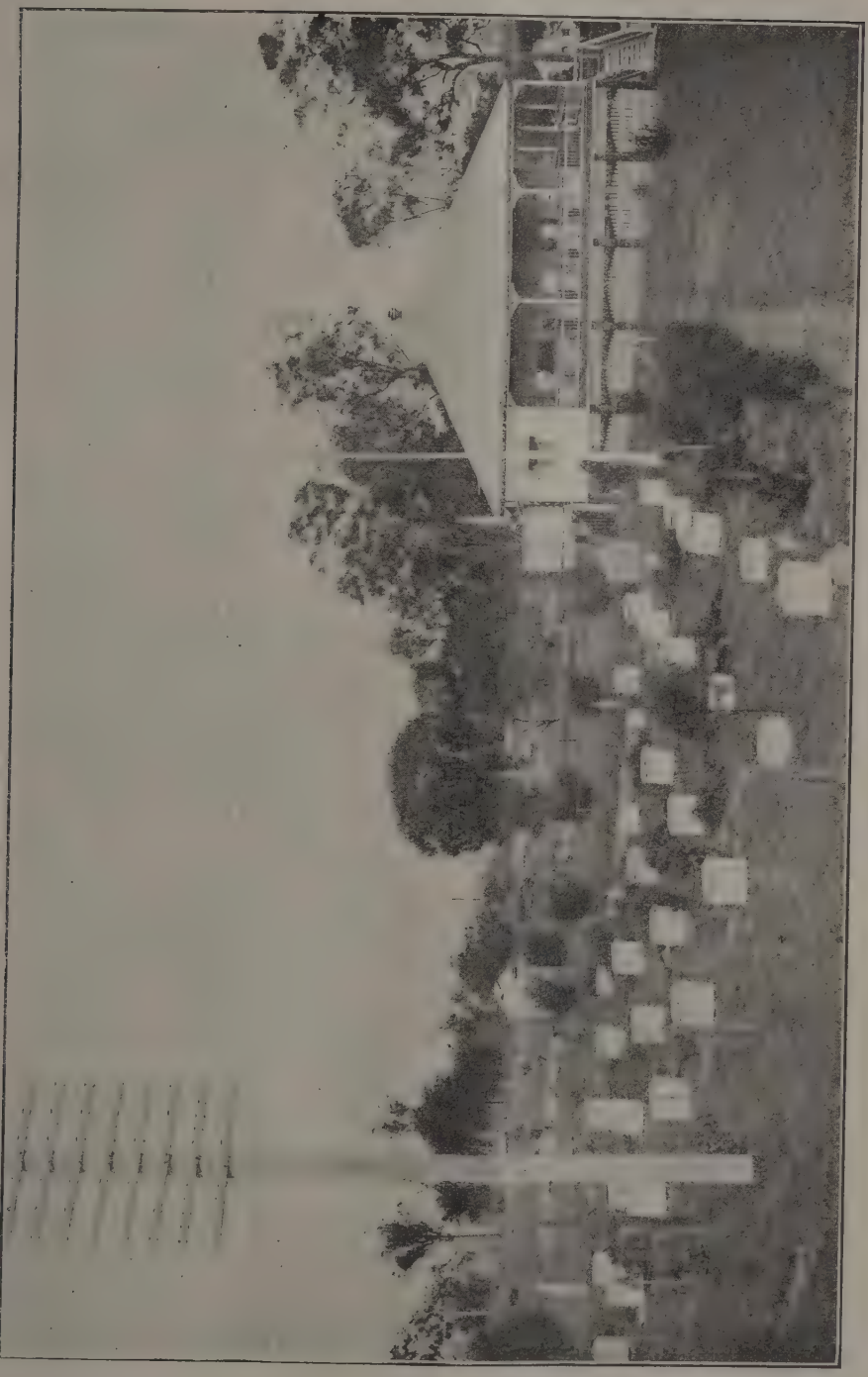

PLATE 14.—A BEEKEEPER'S HOME.

ing the bees. Place this frame on the opposite side of the hive, with one end on the ground. You will now have plenty of room to lift the others out to examine them.

When you want to lift the super off, use the same method as when lifting the cover off. It is better to leave the cover on the super until you have finished examining the brood combs. If you want good returns of honey, do not let your bees swarm. This can be done by giving them empty combs in the super as fast as they fill them. Examine the brood combs once a fortnight, and take off any queen cells that might be on the combs. You will know the queen cells when you see them, as they project out much further than the other brood and are of a thimble shape. The examination for queen cells is only necessary between the months of September and the end of February. Remember that the more bees you can keep in the hive the more honey they will produce. Should you think they are overcrowded, place another super in the centre, with full foundation comb. This is not necessary unless there is a good flow of honey coming in.

The best plan is to have the queen's wing cut, so that if they swarm out at any time the bees will not go away without the queen. Look for the queen on the ground near the entrance, and when found, place her in a cage until the bees come back. I have for over twenty years used a tea ball for this purpose, and it is one of the handiest cages in the apiary for holding the queen at the time of swarming.

Should you want to make another swarm, remove the old hive to another place, then place the new hive where the old one stood, with foundation combs complete, which, of course, you should have ready. Then take one of the brood combs and place it in the new hive.

By this time the bees will be all coming back into the new hive, and you can now release the queen at the entrance and let her go in with the bees.

Now go back to the old hive, and cut out all the queen cells but one. On the sixth day after the swarming look into each hive to see if the queen is in the hives. If you cannot see the queen, and you think she is lost, put in another frame of brood with new-laid eggs, and if the queen is lost, they will make more queen cells immediately.

On the twelfth day after you have put the new eggs in, remove all the queen cells but one, and be sure not to leave any more than one cell, for if you do they will very likely swarm out and you might lose them. Generally speaking, the queen will hatch out on the fourteenth or fifteenth day.

You must on no account cut the virgin queen's wing. When you want to cut a queen's wing, take her into the house, shut the doors, and let her run about the table. Hold her between the finger and thumb (do not be afraid, she will not sting you unless you are squeezing the life out of her). Just clip a small piece off one wing. When returning her to the hive, give the bees a little smoke and let her go in from the top between the frames.

Should you want to go in for section-comb honey, it would be advisable to get one of the bee merchant's catalogues, which will give you all the information you may require.

There are many people that live in the "waybacks" who can get wild bees out of trees, who could thus start beekeeping with very little expense. Buy a single hive with frames; have half the frames filled with foundation comb, but do not wire the other half. Make fifty support hooks of this shape ⌐——⌐ out of some small wire, and make them long enough to fit on the side of the frame. Now place four on one side of the frame, laying it on a board with the hooks on the under side. Place the brood comb you take out of the tree, or any box from which you would like to transfer, on top of the frame. Take a sharp knife and cut the comb all round the inside of the frame. If the comb is not large enough to fill in the frame, fit in small pieces to suit. Now place four hooks on top of the frame as it lies, lift the board up perpendicularly, take the frame away, and place it in the new hive. Three days afterwards you may take all the hooks off again, as the bees will have it all fastened in. Shake all the bees you can into the hive, then place the hive near where the swarm is, and the rest will go in with the help of a little smoke.

Should the queen be killed, the bees will make several queen cells, and another queen will hatch out on the fourteenth day.

Should the new beginner carry out these instructions, he will never regret he started beekeeping.

I have often been asked what is the best remedy for a bee-sting. My remedy has always been to put a little spittle on the place and blow the smoker on it.

———

Oxley Apiary, Oxley.

Every beekeeper should join the Beekeepers' Association, and also take the "Queensland Bee Journal." The subscription is only 5s. per annum for membership and journal. General meetings are held during August, November, February, and May in the Y.M.C.A. room, Edward street, Brisbane, at 8 p.m. Visitors are cordially invited to be present. The hon. secretary's address is—F. J. Glover, Riding road, Bulimba, Brisbane.

Dairying.

DIRECTIONS FOR TAKING SAMPLES OF MILK FOR TESTING, ETC.

BY E. GRAHAM, Dairy Expert, Department of Agriculture and Stock.

In taking the sample of milk the greatest care must be exercised, as upon this practically depends the value of testing.

As soon as the milk is drawn from the cows it should be weighed. A small spring balance is the most suitable for this. Immediately after weighing pour the milk from one bucket to another, and without delay take a small quantity with the ladle as supplied and pour into the sample bottle. The larger sized ladle is to be used for taking the morning sample, and the smaller sized ladle for taking the evening sample of milk.

The composite sample bottles as supplied contain a preservative, and must be kept securely corked after each sample is taken. Do not wash out the bottle before putting the milk in.

Write the name of the cow plainly in the column on the sheet supplied for that purpose, and attach the name of the animal to each sample bottle; then, as the cows are milked, mark the weight of milk below their names, and take the samples as above directed.

When the sample bottles are sufficiently full, they must be sent to the officer in charge of the testing in your district. The officer will furnish you with his address, and give such other information as you may require.

The weighing and recording of the weights of milk yielded by each animal shall be continued throughout the period of lactation. The taking of the composite samples will be done at intervals of about three months. The sample bottles will be periodically supplied by the testing officer.

As far as possible the testing officer will instruct dairy farmers in the practice of testing milk by the Babcock method.

In every instance the full complement of cows in profit in the herd must be entered by dairymen.

It is not intended that the testing officer will give results relative only to a few selected animals from each herd.

In a future issue of the "Agricultural Journal," I hope to furnish some of the actual results and other particulars connected with herd testing since the inception of the work in Queensland.

HAND REARING OF CALVES.

Hand rearing is adopted by most dairymen in order to procure the best monetary returns, but frequently the calf is the sufferer. A young animal requires natural food for the first few months; consequently, it cannot be expected to thrive and keep in good health when it is fed on separated milk, practically devoid of fat, and frequently more or less contaminated with dirt and its accompanying organisms.

It is most important, for the first two or three days after birth, to give the calf its mother's milk (colostrum); this acts as a natural laxative, which is essential to clear the bowels of fœtal deposits (meconium). Following the first few days, the calf should be given about 2 pints of new milk three or four times daily, for at least four weeks, after which skim or separated milk can be given, which is mixed with other foods, such as oatmeal or linseed gruel, the latter making up for the abstracted fat. Usually, when the calf is six weeks old, it begins to pick grass or a little hay, but the skim milk and linseed should be continued until the calf is three or four months old, and always given at about the normal blood heat.

LINSEED JELLY.

Boil slowly, for three or four hours, 1 lb. of linseed in 3 quarts of water, so that about 2 quarts of jelly or thick fluid remains. Mix about 4 oz. with the separated milk at each meal. Increase quantity as required.

OATMEAL GRUEL.

Mix 1 lb. of oatmeal in 1 gallon of cold water, and then boil; keep well stirred; then allow to simmer over a slow fire until it becomes thick. Allow 4 to 6 oz. with separated milk at each meal.

Tropical Industries.

THE CANE CROPS IN THE BUNDABERG DISTRICT.

A SATISFACTORY OUTLOOK.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray:—

"During the month the canegrowing areas of Bundaberg (Sharon, Gooburrum, and Oakwood), Bucca, Avondale, Bingera, and Gin Gin have been visited.

"SHARON, GOOBURRUM, AND OAKWOOD.

"The outlook on these places is distinctly pleasing for the coming season. The recent steady rains have done good work, and the plant cane, especially the Autumn planting, is making vigorous growth. The red scrub loams are responding more rapidly than the forest soils, the latter in many cases being badly in need of renewing, owing, in some cases, to its having been worked out, and in other instances to its being naturally deficient in plant food properties. Filter press cake is a useful commodity on the latter class of soil. Large quantities are required, however, before the result of using is noticeable. Mr. Dawson, a Gooburrum grower, got excellent results on a patch of forest loam by using about 16 tons per acre of filter press cake. The cane supplied, a last March D.1135 plant crop, is probably one of the best in the district.

"Speaking of varieties, D.1135 is still principally grown on these areas, although down on the river banks below Sharon, 1900 Seedling is making a splendid showing.

"There is a disease noticed by the farmers on these areas that they call 'bleeding.' After the cane has been cut, a considerable amount of fermentation takes place on the stool from which the cane was removed. It is a heavy, sticky fluid, and oozes up in fair quantities.

"The cane on Oakwood is looking well. The growers here would be well advised to thoroughly lime and green-manure as soon as they possibly can. The soil is not rich in organic matter and the reaction is acid. Nevertheless it is good farming land, and could be built up to an excellent cane growing standard. Deep cultivation is also very essential on this area.

"BINGERA AND BUCCA.

"Owing to wet weather and the sticky condition of the roads, some time was lost inspecting these places. The Bucca highways are notoriously bad, and the people in such a prosperous district deserve a better fate. With regard to Bingera, good rains have recently fallen, and the prospects are excellent. The plant cane is well advanced, and looks healthy, both Autumn and Spring. The farms are well cultivated, and judging by the excellent tilth obtained and the precision of drilling and general layout of the holdings, the growers this year are making big efforts to get the best returns possible in the future. It is too soon yet to estimate, even roughly, what the cutting will be like, but it would probably be a good guess to say that everybody connected with the industry will be well satisfied. At Bucca conditions look more promising than they have done for years. The country looks a picture, and the cane is making great growth. More land is being cleared and planted, and the cane-farmers are enthusiastic about their prospects. Lime is still required on the majority of the farms, also green manures. The roads, as previously mentioned, are bad, this being a considerable drawback, as the people have to depend on these for their transport to and from Bundaberg, there being no rail nearer than Avondale, and Bundaberg is the nearest market.

"With reference to varieties, D.1135 appears to be about the best. Others are Q.813, as yet just a few stools growing, 24A, Rappoe, and Mahona. Of these, the Q.813 appears to be easily the best, although there are only a few stools on Mr. Fisher's farm, but more of this variety could safely be planted. Mr. Moore and Nelson Bros. are growers who have a lot of cane in this year, which, judging by present appearances, should give them a big crop. Nelson Bros. are returned soldiers, and had to do much clearing after their repatriation, so that their farm reflects great credit on them. Live stock looks well at Bucca, and there is abundant grass. The Kolan River is high, and the springs on the flats are flowing.

"AVONDALE.

"This area also shows the effect of good rain, and most of the farms are already showing good crops of cane. The greater part of the cane is grown on the Plantation side, Mr. Alexander being about the only grower up the river who has any cane. He has about 15 acres. On the Avondale side, cane is still the principal product.

"Touching on varieties, M.1900, D.1135, Yuban, and Mahona are the principal canes grown. Yuban, which was planted extensively by Fairymead last year, is now being displaced by D.1135. It is not advisable for small farmers to plant the former variety. 1900 Seedling is looking well, and will probably give the grower the most profitable return. The cane is fairly free from disease here this year, and parasites, such as borers, are not causing much anxiety. The soil in many instances wants renewing, and with this end in view, as opportunity offers, the farmers should endeavour to plant cowpea or Mauritius bean extensively.

"GIN GIN AND MAROONDAN.

"The prospects on both these places look particularly bright. On all the Gin Gin sub-areas, Watawa, Currajong, Fairy Hills, and Wallaville the cane is doing well, and the mill should have a very fair crushing. There are dozens of growers that could be mentioned who are well satisfied, and justifiably so. The land is now in splendid order after the rain, and many farmers are busy preparing for the Autumn planting. Cane should pay well here in the future, if the long drought has properly broken, and growers would be well advised to devote the whole of their energies to cane production. Of the varieties that are mainly raised, 1900 Seedling and D.1135 (Fairymead) are doing about the best. Mr. Stollznow, a Currajong grower, has some cane on his place he calls 'Nerang,' but it is an early maturing variety known as H.Q.285, given out by the Sugar Experiment Stations some years ago. It is a good cane, and making a fine showing on his farm.

"With regard to Fairy Hills, a feature of this place is the quantity of limestone available for burning. Right in the centre of the cane area, and handy to other centres where lime is needed, it really ought to be exploited.

"At Maroondan, probably the best crops of 1900 Seedling south of the tropic are to be seen. This district should give a heavy yield of cane next season. The soil is in splendid condition, and the good growing weather is fairly making the cane move along. A feature of this place is the high sugar content of the cane. Messrs. Sondergeld Bros., who, in common with other farmers, suffered with the drought, have managed to get a heavy crop of cowpea turned in, and judging by the present condition of the soil, should find they have been well paid for their trouble. The roads are bad round Maroondan, especially since the heavy rain."

RATS EATING MATCHES NOT A CAUSE OF FIRE.

ELABORATE EXPERIMENTS PROVE THEY WOULD RATHER STARVE THAN EAT MATCH HEADS.

In the lengthy category of reasons and excuses for fires, that of friction due to the gnawing of match heads by rats and mice has had to bear its full share. When all else could prove an alibi the rats were blamed. The increasing number of fires attributed to this cause emphasised the necessity of establishing the possibility of its being bonâ fide.

The Underwriters' Laboratories, Inc., of Chicago, after careful and prolonged experiments by its fire prevention engineers, has reached the definite conclusion that rats would rather starve to death than eat the modern match heads.

This conclusion was arrived at through a series of elaborate tests, covering a period of eight months and more, in which numbers of rats were placed in enclosures with boxes of matches arranged so that they could reach them. The first test was made without feeding or watering the rats; in the second they were given water, but no food; and in the third they were given food and water for two weeks and then starved, but supplied with water until they died. Occasionally the strawboard boxes were gnawed and the boxes broken open and matches scattered all around, but although frequently the rats ate one another, in no case were the match heads gnawed nor was there any apparent danger of ignition.

With this positive evidence in their possession, investigators of fires will view with greater suspicion a fire which can be attributed to no other cause than that of rats gnawing matches.—"Conservation," Ottawa, Canada.

Botany.

ILLUSTRATED NOTES ON THE WEEDS OF QUEENSLAND.

By C. T. WHITE, F.L.S., Government Botanist.

No 20.

STARR BURR (Acanthospermum hispidum, DC).

The Star Burr (*Acanthospermum hispidum*) has lately been gazetted a noxious weed throughout the State, and as several requests for a description and illustration of the plant have been received from shire councils and others, the following description has been prepared to aid in the weed's identification:—

Description.—A branching annual, 2 to 3 feet high, the branches and leaves covered with rough hairs. Leaves opposite, from under 1 to over 2 inches long. Flower heads solitary and sessile in the axils of the leaves. Achenes 10 to 15. Each achene when ripe is 2 to 3 lines long, oblong in shape, and narrower at the base than at the top; the whole surface covered with short hooked spines and crowned at the apex with two slender hooked spines, one on each side, and about 2 lines long; the ripe achenes are arranged in groups of 5 to 10, and radiate outwards in the form of a star.

Distribution.—A native of Central and Southern Brazil; was first recorded as naturalised in Queensland by the late F. M. Bailey in 1904 (*vide* this Journal, vol. XV., p. 493). It is now one of the worst weed pests in Northern Queensland, and I have noticed odd plants as far south as the neighbourhood of Brisbane, but, so far, it has not manifested itself as a bad weed in the temperate parts of the State.

Botanical Name.—Acanthospermum, from Greek *akanthos,* a spine; *sperma,* a seed; in relation to the two sharp spines at the top of the achene ("seed"); *hispidum,* Latin, meaning rough, shaggy, prickly, or bristly.

Properties.—I cannot find recorded any use made of the plant in South America or elsewhere. It is not known to possess any harmful or poisonous properties. The prickly "seeds," like those of the "Noogoora burr" and "Bathurst burr," easily attach themselves to the coats of animals, and are thus widely distributed from one place to another.

Eradication.—As the plant is an annual, eradication should be attempted, if possible, by hand-pulling or hoe chipping before the plants have had time to ripen their seeds. Spraying with an arsenical weed-killing solution should prove satisfactory where the plants are growing thickly together and stock can be kept away from them.

GRAPE CROP, 1921.

Mr. C. Ross, Instructor in Fruit Culture, when visiting the Maranoa district, found the grape crops in splendid condition, and said that they were the best and heaviest produced for many years. Unfortunately, the growers are handicapped by the cost of transport to Brisbane and elsewhere, and by the losses sustained annually during transit. In consequence of these disabilities, very few western grapes have reached Brisbane this season, the growers finding it paid them better to sell to the local winemakers. Thus, grapes, which Mr. Ross describes as the best he had ever seen, have not found their way to Brisbane. The best results were from the Gordo-Blanco and Snow's Muscats. The returns were very heavy, some of the land under vines having yielded over 3 tons of fruit per acre. From one 5-acre block 1,600 gallons of wine were made. Messrs. Bassett and Sons (of Madeira fame), Roma, have 220 acres under vines, and the entire produce of this area goes to the wine press.

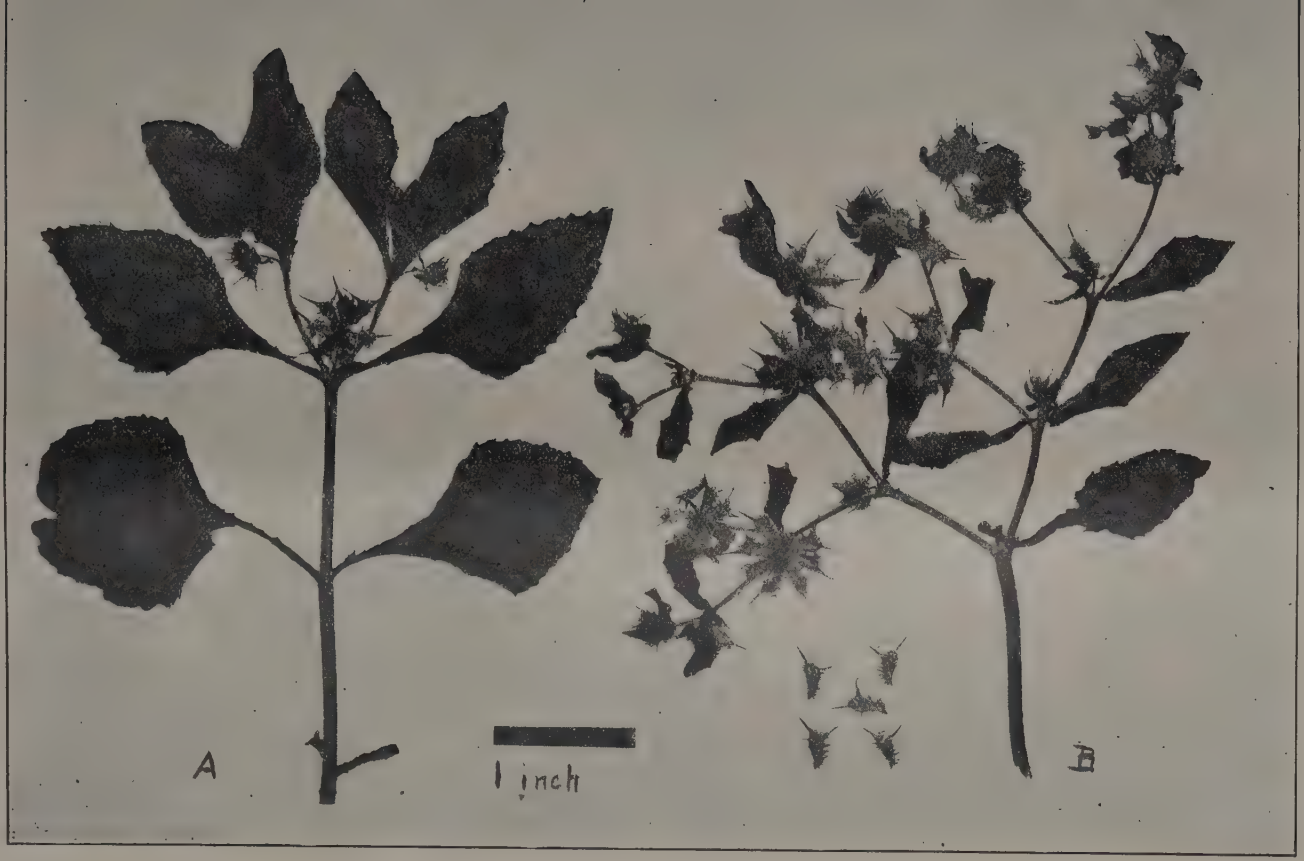

PLATE 15.—STAR BURR (*Acanthospermum hispidum*).

A.—Shoot from comparatively young vigorous plant just commencing to carry burrs.
B.—Shoot from an older plant, more branched, bearing smaller leaves and carrying numerous burrs. C.—Achemes or "seeds."

Entomology.

CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report upon the Cane Grub Investigation, from the Entomologist, Dr. J. F. Illingworth:—

"The outlook for the next season's crop is most promising, for growing conditions are perfect, as far as climate is concerned. We must expect, however, considerable devastation from grubs in some of their favourite haunts. Greenhills, as usual, appears to be coming in for her full share. Fortunately, most of the several hundred acres of plant-cane on this estate was treated with arsenic, so that I hope for a thorough demonstration of the efficacy of this method of control. As mentioned last month, we can also hope for some immunity on certain of the ratoon fields, because of the removal of feeding trees along one side of the estate. Mr. Dodd and I have made material progress in a knowledge of the habits of the several species of cane beetles, in the field, by working early and late during the present flight. Since the end of November, it has been necessary to start observations by 5 a.m., keeping them up daily even through the holidays; and it is usually 9 p.m. before the work is completed for the day. Furthermore, these strenuous duties must be kept up for a few weeks longer, until the aerial life of these pests naturally comes to an end.

"AERIAL HABITS OF CANE BEETLES.

"*Lepidiota albohirta*.—We have now very definite information on these greyback beetles. Most important, perhaps, is that they are not satisfied with laying one set of eggs, for under normal conditions they continue this reproductive process as long as they are able to be on the wing. It has naturally been supposed that when they flew into the field and laid their eggs, they died. This is seldom the case, however, for we have clearly demonstrated that they return to the feeding trees and form a fresh set, though sometimes a smaller one, which they are usually able to bring to maturity. Again, as is well known, these beetles have two daily flights—morning and evening. We have found that the evening flight, between 7 and 8 o'clock, is primarily a mating flight, the beetles coming from the cane or from other feeding places, if they are already stationed in the trees, the males seeking out the receptive females. After 8 p.m. copulation ceases, and all of the beetles feed quietly until dawn. About 5 a.m. again there is activity in the camp, and the morning flight begins. In this they simply seek better locations among the foliage for the day; or in the case of females ready to oviposit, after circling a few times as if by instinct, they take a bee-line to a favourable location. I have seen them thus, between 5 and 5.30 a.m., coming into the cane in great numbers. At the latter time on clear mornings their flight ceases, and they settle on the cane leaves with their heads up; here they cling for a considerable period, perfectly motionless; and finally, as the rays of the sun begin to warm them up, they fall to the ground and usually crawl under the nearest stool, where they enter the soil. In doing so, the head works under any convenient object which is used as a fulcrum to assist them in getting in. Of the numerous specimens collected on the cane leaves at the termination of the morning flight, I have failed to find a single beetle that was not packed full of ripe eggs; and when they were given soil of the proper moisture, &c., they invariably laid at once, and soon reappeared on the surface, hungry and ready to start life all over again. Furthermore, we have demonstrated that the beetles make their first meal upon the cane leaves when they come out of the soil, both at the time of the original emergence from the pupal cell and after they have oviposited. They stay upon the cane leaves for the first day in each case; and during this period they usually eat out considerable notches in the leaf-blade, very similar to the destructive work of grasshoppers, cut-worms, &c.

"*Lepidiota frenchi* is second only in importance to the above, so we have given it special attention. This species, also, has the two daily flights, like the greybacks; they apparently differ from them, however, in being able to subsist entirely on the cane leaves, when other feeding plants are not available. This, undoubtedly, is largely due to the fact that they eat but little, compared with the greybacks; and their eggs are well developed when they first emerge. In fact, they are evidently able to lay within a week after coming out. Thus they have a considerable saving

of energy, which must naturally be expended by the larger species to form the eggs from the beginning, after the beetles appear above ground. On numerous occasions I have observed these beetles during the evening flight in cane areas far removed from any feeding trees. Under such circumstances, ignoring the financial aspect, the experience is most interesting. One waits expectant; everything is quiet, when, suddenly about 7 p.m., as dusk approaches, a seething horde appears out of the ground; everywhere there is apparent confusion as the myriads of beetles whirl to the right and left, frequently striking the cane leaves in their mad search for mates. After approximately ten minutes the flight is over, and all is quiet again, for the beetles have come to rest in pairs upon the leaves of the cane, or any other available object. About half-an-hour later, when it is getting quite dark, there is a second minor flight, composed largely of the males, which always fly away from their mates as soon as copulation is completed. After circling about for a brief period, they apparently again settle on the cane leaves, for both sexes can be found there in the early dawn. In fact, I have gathered quantities of them as they sat there quietly, all covered with dew, on the topmost leaves; under these conditions they appear cold and stiff, for they drop to the ground if the leaf is touched, making no attempt to fly away. Just preceding 5.30 a.m., when the morning flight starts, all the beetles begin to stretch themselves, moving their heads and legs; at the first signal hum, however, they are all off for a little exercise before going into the soil. It appears to be the habit of gravid females to settle on the ground at once, where they soon crawl under stools, and burrow in, to oviposit. The males, on the other hand, alight first on the leaves, and after a brief rest crawl down and enter the soil, but do not go so deep. Fortunately, this species is not yet addicted to a life in cane areas; they much prefer the open forest lands, with the numerous low bushes, among the grass. When such lands are cleared, however, and planted to cane, they have no recourse. Moreover, I do not know of a single case where they have moved from grass areas into cane lands that were formerly free from them.

"OVIPOSITING OF CANE BEETLES.

"*Lepidiota albohirta*, as we have always supposed, naturally lays her eggs at the base of the cane stools. Heretofore, however, we have had little field evidence on which to base this conclusion, other than that the resulting grubs are usually to be found there. This, apparently, is due to the fact that no one has gone deep enough in digging. I first placed a number of gravid beetles, collected from the cane in the morning, in a cage in the garden; and a few days later, excavated to locate the egg-chambers. I was considerably surprised, however, to find that they burrowed so deeply; the nine egg-chambers thus located varied in depth from 10 to 14 inches, with an average of twenty-six eggs each. With this information I was able to work more intelligently in the field. We dug two trenches in one of the old, abandoned, grub-infested fields at Greenhills; each trench was about 4 feet wide by 6 feet long, and 2 feet deep, two stools of cane being in each of these excavated areas. The results were most surprising; we found many tiny grubs in various sizes, up to a fortnight old, and twelve egg-chambers of the greyback beetles. These varied in depth from 8 to 18 inches, averaging 12½ inches; the clusters of eggs varied from 23 to 33 in a set, with an average of 28.2.

"*Anoplognathus boisduvali*.—In one of these trenches we also found a set of fifty-three newly-laid eggs of the Christmas beetle, which is also a troublesome pest of cane fields, and several grubs of this species in both the first and third stage. We also found an adult male beetle still in his pupal cell about 10 inches deep.

"*Lepidiota frenchi* was handled in much the same way that I did with the greybacks, placing a cage in the garden, and I found that they, too, go much deeper to oviposit than has been anticipated by former investigation. Furthermore, they do not lay all their eggs in one basket, as the greybacks do, but scatter them about in several parcels in the soil, each egg in its own tiny cell, the number varying from five to ten. They were placed at an average depth of about 8 in., in heavy clay soil. Later I found eggs in the field, under natural conditions, at a depth of about 10 in. This species lays on an average about thirty eggs for the first set, soon after emerging, and is evidently able to produce successfully a second set before succumbing. Hundreds of mating pairs may be seen almost any evening during the two months that they are on the wing. They are not at all particular where they hang up to copulate, for when numerous they hang on the wire fences, or, in fact, upon any object that presents itself. Recently I took fifteen pairs, hanging one couple upon another, on a small dry stick not more than 2 ft. high in an open field.

"*Anomala australasiae* is apparently much more rapid in development than any of the above; at any rate, some of the grubs had already reached the third stage by 16th December, just one month after the parent beetles were first observed on the wing. This small green beetle is becoming more and more abundant in cane areas,

and the grubs undoubtedly do considerable damage. The eggs are probably laid from time to time as they develop, for new sets are usually in a process of development in all the females dissected shortly after the primary emergence.

"*Lepidiota rothei* has not been much in evidence this season, though it has a one-year life-cycle, and has been very abundant in former years in the vicinity of this station. Evidently they have had a natural setback some way. Dissection would indicate that the eggs are not laid in regular sets; rather that they are deposited a few at a time, as the beetle enters the soil for its daily hibernation. Mating habits resemble those of the other *Lepidiota* in that the male hangs head downwards during copulation; but the period in this species is very short, lasting not more than two minutes.

"CONTROL MEASURES.

"*Hand picking.*—A few words on this subject may be of interest, for it may prove practical to gather the gravid female greybacks from the cane leaves after the morning flight, say from half-past 5 until about 8 o'clock. Every beetle so destroyed removes approximately twenty-six grubs from that stool of cane. When the flight is at its height it is possible for a man to gather a considerable quantity of the beetles in an hour or so by walking up and down the rows. If the cane is not too high one can see the beetles on a strip three or four rows wide. On the other hand, my investigation further emphasises the futility of collecting generally upon the feeding trees, especially if done more than two weeks after the primary emergence. In one lot that I gathered thus, I found that 86 per cent. were males, the remaining 14 per cent. being females that had laid their eggs and were empty. Possibly these females would develop more eggs, but this is questionable, especially late in the season. Nevertheless, a week later, when I dissected a collection of greybacks from Greenhills, I found an excess of females, indicating that the males had already begun to die off from old age, since they had been on the wing for six weeks or more. Furthermore, most of the females are now back at the feeding trees, in an endeavour to produce more eggs before they, too, succumb. *Natural enemies* are doing their share in the control of these pests. Muscardine fungus is still in evidence in the grub-infested fields at Greenhills, as demonstrated by our excavations there, for we frequently come upon its activities. It does not often appear to be effective in the destruction of the newly-hatched grubs, but I have recently noted the full-grown grubs of *Lepidiota frenchi* which had succumbed to this disease. The grub-infested areas always swarm with *Campsomeris* wasps; and I have recently found that several species of *Asilids*, also, frequent these fields, laying their clusters of eggs upon the leaves of the cane. The young are exceedingly numerous, and upon hatching drop to the ground and enter the soil in search of the young grubs about the stools. These tiny larvæ are very effective, once they locate the grubs, which are their natural prey. In my laboratory experiments with them they have already killed twelve young grubs in as many days. They burrow into the grub at any point, but preferably the back where they cannot be reached, and suck out the body juices. Apparently, they have some power to paralyze the grub, for it soon ceases activities when set upon. The beetles, too, have their enemies, which attack them while in the feeding trees throughout the day. Naturally many species of birds reap a harvest, and we are breeding out some new species of flies that attack them. Furthermore, Mr. Dodd recently found a most interesting bug, *Amyotea hamata*, about half-an-inch in length, which sets its beak into its prey and puts it out of action. When discovered, this bug had a full-sized greyback many times its own size, but the beetle was kicking his last. When the bug was put into a glass jar with another beetle it soon punctured it, right through the wing cover, and the beetle died. This predator would be most useful, if it would only appear in greater numbers."

DESTRUCTION OF NUT GRASS BY INSECTS.

VOLUME II., "Q.A.J.," PAGE 324.—DISCUSSION BY HUNTER RIVER AGRICULTURAL ASSOCIATION, N.S.W., 1898.

A Mr. Scobie had 3 acres of vines smothered with nut grass, but completely got rid of it. He ploughed the ground in the winter; then, whenever he found signs of living grass, he kept the scarifin going with knives 3 to 4 inches below the soil. If the ground got hard he ploughed again. That was done for two years, when it was entirely banished.

A Mr. Bishop mentioned a case where a 5-acre paddock was covered with nut grass. He sowed it thickly with imphee and then smothered it, but it took five years to do so.

AGRICULTURAL AND PASTORAL CONFERENCE AT GATTON COLLEGE, JUNE, 1899, PAGE 169.

Mr. W. Gibson, Bundaberg, said he had destroyed nut grass completely by pouring a few casks of molasses over it.

Mr. Booker (Woolaga) said that nut grass can be entirely destroyed by fencing it off and running pigs on the land.

Early in May, 1903, it was brought under the notice of the Department of Agriculture that in the Singleton district of New South Wales the notorious weed, nut grass, was dying through the attack of an insect parasite, some of which arrived in Queensland. But the Queensland Government Entomologist, Mr. H. Tryon, had anticipated the arrival of such consignments, and had taken steps to intercept them, in order to ascertain, before admission, the degree of probability of its attacking other plants besides nut grass. Until this question was settled, it was rightly considered most injudicious to establish this nut-grass-destroying insect in our State. Although the plant seeds, experience has shown that the pest is not propagated otherwise than from the nut and root.

There is one method for disposing of nut grass in a small garden, and that is to make borings into the clumps of the pest with a piece of gas-pipe, go well down, then fill the openings with salt, and water it well. This, if thoroughly done, will kill all the roots. But this also has its disadvantages in that it is not applicable to beds where other plants are expected to be grown, and present labour conditions make it too costly. Soda refuse from soapworks has the same effect.

A patch of nut grass was destroyed in the Acclimatisation Society's grounds at Bowen Bridge by placing a thick heap of strong new manure on the same. This, through the fermentation it undergoes, will kill any plant life that may be under it. This is, however, a lengthy and expensive application.

To come to the possible destructive powers of an insect, we find that in 1913 Mr. E. Jarvis, Assistant Government Entomologist, visited Bundaberg to study the economy of an insect which was said to be killing nut grass. This insect is named *Antonina australis* and was discovered on nut grass at Singleton, New South Wales, in 1903.

About the year 1910 Mr. F. L. Nott, of Bundaberg, obtained a bagful of infested grass roots, and pieces of this he planted in rows across the area to be treated, from 40 to 50 feet apart, and 20 feet from plant to plant, 3 inches below the soil, against the root of a flourishing clump of the weed. Operations were then suspended for a few months to allow the insects (coccids) to become established, and extend a few feet from the infected centres, after which the ground is ploughed and harrowed and planted with a cover-crop of lucerne, sugar-cane, or pasture. No cultivation is allowed until at least twelve months after the death of the grass tops.

Authorities are fairly well agreed that the danger of the insect attacking other plants is very slight.

The *Antonina* is closely related to the cochineal insect, and the latter will not touch allied plants of the same genus.

PROTECTION OF NATIVE BEARS AND OPOSSUMS.

The Minister for Agriculture and Stock desires to make it known that after a full consideration of all the surrounding circumstances the Government has decided to give protection to native bears and opossums for the remainder of this year and until the 30th April, 1922, at least. In other words, the close season will be extended to the date fixed by the Act in each year.

The Minister is quite aware that this decision will evoke objections from many who have different opinions concerning the question, but he wishes to make it known that during 1919 and 1920 the slaughter exceeded 5,250,000 opossums and 1,000,000 native bears (the latter were protected in 1920). These figures gathered by the Department, astounding as they are, do not by any means represent the total of the animals that were slaughtered, but they indicate only the number that were traced through the markets. Upon these figures alone it is evident that if our native animals are to be preserved from extinction some time must be allowed for breeding up, and it has been decided that this year shall be set apart for that purpose. Moreover, the skin market is not nearly so good as it has been during the last few years, and for this reason the present is an opportune time for protection.

Science.

EXPERIMENTS WITH CHLORINE IN DESTRUCTION OF FLYING FOXES.

The following report on the experiments made during the month of February by the Department of Agriculture, with the object of ascertaining the efficacy of chlorine gas in the destruction of flying foxes at Upper Coomera, has been forwarded to the Department by the officer in charge, Mr. F. L. Cheshire, who stated that the experiments show that chlorine is not a suitable gas for the work for the following reasons:—

(*a*) Gas too heavy, the great concentrations remaining at 20 feet and under, and if shot higher rapidly sinking.

(*b*) The gas which did penetrate to the foxes on the trees was apparently quickly irritating enough to make them take to wing before they suffered any real damage, and the camp in proximity to the gas remained on the wing until the gas had diluted so as to no longer be effective on them.

In regard to (*b*), when the cylinders were discharged a large number of the foxes took fright and took to the wing.

Of the ten cylinders of gas, eight were used, the screw-top of the other two snapping, and so they could not be turned on. The cylinders were used in two groups of three and four respectively (one cylinder was used separately for preliminary observation). The first group was intended to be five cylinders but for the screw-tops breaking.

One group was fired at 11 a.m. on the 9th February. The wind in this case veered back, but the result would not have been different.

The second group was fired at 7 a.m. on the 10th February. Both were ineffective.

The experiments, I think, go to show that both chlorine and phosgene can be disregarded in any future experiments on flying foxes; but it seems to me that the so-called "mustard gas" of the late war must be very favourably considered in regard to its chances of success in this work. There would be difficulties in adapting its use, which would have to receive special detailed consideration.

This gas would not require such elaborate precautions when using (from the general public standpoint) as with big volumes of chlorine or phosgene; but "mustard gas" is much more trying from the operator's standpoint.

Some points which make "mustard gas" very attractive for the present purposes are:—

1. Very great eye effect, and burning effects.
2. Remarkable persistency on account of slow evaporation of liquid and splashings.
3. Would not quickly irritate like chlorine or phosgene.

SYNTHETIC AMMONIA: A FRENCH INVENTION.

In its issue of 21st November, "Le Matin" published an article on the manufacture of synthetic ammonia, containing the following references to a recent French invention:—

"If the Germans were able to hold out for four years against the allies it was, above all, because they knew how to replace Chili nitrate, which could no longer

reach them, and which was the essential ingredient of their manures and their explosives, by other nitrogenous products which their chemical industry had successfully created from their very inception. It was because in the colossal works of the Badische Company they had succeeded in continuously manufacturing these bodies by the fixation of the nitrogen of the air with the Haber process. On this process, which almost succeeded in gaining them the victory, the Germans are counting for restoring their supremacy in peace.

"Now, facing the very efficient Haber process, a French process is to-day being perfected which is proving itself conspicuously superior to the German process, and which, provided the wings of its first essays at flight are not clipped, can and must to-morrow take from our enemies their present unchallenged supremacy in industrial chemistry. The inventor of this process is the young and known physicist, Georges Claude, the very same to whom France already owes the creation of the industry of liquid air. Yesterday, with a number of members of the Academy of Sciences, Messrs. d'Arsonval, Berthelot, Bigourdan, Janet, Lallemand, Moureu, Tisserand Lemoine, with several Ministers, Mr. Breton, who does not forget that he was Minister of Inventions, Mr. Reibel, and many other parliamentary leaders and experts (some are both), we were able to admire the ingenious invention of Mr. Georges Claude in full working.

"In the German Haber process the nitrogen from the air is fixed on hydrogen to form ammonia in tubes where the pressure is about 250 atmospheres. It was believed formerly that pressures of this order could not be exceeded without danger. Now Mr. Georges Claude—and this is the most essential feature of his invention—has proved that this is not the case, and that not only is it possible to produce pressures far in excess of these, but that they possess many advantages. The nitrogen from the air is separated by fractional distillation of the oxygen of the air after liquifying the latter, and it is a very curious thing to see these liquids, whose temperature approximates to 200 deg. C. below zero, flowing by the bucketful from an apparatus of quite modest dimensions. This nitrogen returned to the gaseous state is mixed in suitable proportions with hydrogen, and the mixture is compressed to 100 and then to about 200 atmospheres in ordinary compressors. Then they are taken into a new compressor, which compresses them to the astonishing pressure previously considered to be industrially impracticable of 900 atmospheres. How has this been rendered possible? Simply through the fact that the more the pressure on a mass of gas increases the more its volume diminishes, and consequently, the smaller the size of the apparatus becomes, the greater its resisting power and its stanchness will be. However this may be, whereas with the pressure of 200 atmospheres used with the German process, 10 to 12 per cent. at most of the gaseous mixture was converted into ammonia, this proportion is more than tripled with the high pressures of the Claude apparatus. It is in this respect, above all, as also because of the space occupied and of the far lower cost of the French plant, that its enormous advantages consist. It should be added that the high pressure permits the ammonia generated being collected wholly and directly in the liquid form—which the German process does not permit.

"At the present moment Mr. Georges Claude has already realised a daily output of a ton and a-half of ammonia, corresponding to 7 tons of sulphate of ammonia, and this with plant and works proportionately thirty times smaller than what would be required by the Badische for an equal output. On the other hand, it is not under the form of sulphate, but of chloride of ammonia, that Mr. Claude intends to furnish our farmers with the manure they require. This will permit of the chlorine being used, which is given off in large quantities in the industrial manufacture of soda—in short, this will permit of wedding the separate interests of these essential industries—soda and nitrogenous products. In comparison with these most powerful appliances of such small volume, the enormous German apparatus, with very indifferent efficiency and their 'colossal' complications, makes one think of the classical saying—the mountains were in labour and they brought forth a mouse."—"Planters' Chronicle" (Madras), January.

JAPAN PROHIBITS AUSTRALIAN FRUIT.

The "Fruit World" states that advice has been received from the Secretary of State for the Colonies that, with the object of preventing the introduction of codlin moth, Japan has prohibited the importation of Australian apples, pears, quinces, peaches, plums, apricots, and nuts.

General Notes.

TO MAKE OLIVE OIL AT HOME.

By C. H. BEAUMONT, Orchard Instructor.

Many people have a few olive trees. The quantity of fruit from them may not be considered enough to gather for the purpose of selling; they may, however, be of sufficient weight to make a supply of olive oil for home use. The process is a very simple one, and the appliances required may be found in most homes, with the exception of the crusher, and even that machine is often used by owners of fowls, for crushing dry bones for food for their fowls.

The olives should be ripe or nearly so; those which drop to the ground are not to be wasted. The olives need not be picked separately like fruit, but be stripped, either into a bag tied round the waist, or on to bags spread on the ground. The fruit may be kept spread out thinly for one or two weeks to wilt, or it may be at once crushed. Several machines in general use will do for crushing olives. The machine for crushing dry bone, or that for crushing corn, will do; in fact, any machine that is strong enough to break up the seed of the olive will be sufficient. For such a small plant about 10 lb. of olives at a time will be the quantity to use. Collect the crushed mass in a bowl or half-kerosene tin. It looks like a lot of wet linseed meal.

To get the oil it is necessary to have a number of pieces of canvas of the quality of a good sugar bag, and of the size of a 70-lb. bag. Lay a quantity of the crushed fruit in the centre of the canvas, about 1 in. thick, and over about one-third of the surface. Fold the sides over, then turn the ends over, and the mass is enclosed in the canvas, and is ready for the press. Seven or eight of such lots may be made ready, and can all be pressed at once. A press must be something with a solid foundation, and which can be worked up to a good pressure. A screw press will be best, but a press may be made by placing a good tray of a kerosene tin cut long ways on top of a strong table or on a flat log. Build the mats of the crushed fruit into the tray, being careful to have them level and even; put a clean board over the fruit mats. A lever must be made of a piece of timber or a sapling, say, 7 ft. long and about 4 in. by 3 in. One end of the lever must be fastened down to a tree or post, or be inserted into a hole in the wall. It will then be laid across the mats of fruit, and a gentle pressure exerted at the far end will cause the oil and water to come through. The pressure will be increased until the mats are almost dry.

The oil and black water are to be drained from the tray by a hole in the edge of the tray, from which it will run into basins or, preferably, into glass preserving jars, so that further operations may be watched easily. The dried pulp is taken from the mats and mixed with hot water, enough to make it of the same consistency as it was before pressing; it is again put into the mats and again pressed. The operation may be repeated at least three times. On examining the jars, the oil will be found on the top of the fruit juice and the added water, which is a nearly black colour, and is referred to as black water. The oil may be decanted, but it is easier to syphon off the black water by using a length of rubber tube with a short length of glass tube in the end. By this means it is easy to separate the oil from the black water, and this operation must be done as soon as possible after pressing; if left very long, the oil will take up the bitter flavour of the black water. The crude oil must now be filtered; perhaps twice, or maybe three times, to get it quite clear and bright.

A filter may be made of half a jam tin or similar vessel, by punching a number of small holes through the bottom with a nail; then lay carefully in the tin about 1 in. thick of cotton waste, which has been well teased out, or silk waste is better, but is more costly. Fix this filter over a basin and pour in the crude oil slowly. Filtering is the slowest part of the process, and several filters may be worked at one time. If some black water has come through with the oil, it must be separated by decanting. When the oil is clear it is ready for bottling. The bottles must be clean, and they must be dry before pouring the oil into them. Oil keeps better if stored away from the light.

For larger quantities of fruit the operation is the same, but special machinery is, of course, required. Different manufacturers use varying plants, especially for filtering quantities. Some bottle direct from the filter; others prefer to mature the oil before bottling.—"Journal of Agriculture of South Australia."

SOCIETIES, SHOW DATES ETC.

ALLORA.—Central Downs Agricultural and Horticultural Association. H. G. Deacon. Show dates: 16th and 17th February.

ATHERTON.—Atherton Tableland Agricultural Society. W. Morris, Secretary. Show dates, 18th and 19th May.

AYR.—Lower Burdekin Pastoral, Agricultural, and Industrial Association. C. G. M. Boyce, Secretary. Show dates: 5th and 6th August.

BLACKALL.—Barcoo Pastoral Society. W. P. Tilden, Secretary. Show dates: 17th and 18th May.

CAIRNS.—Cairns Agricultural, Pastoral, and Mining Association. A. L. Nevitt, Secretary. Show dates: 8th and 9th June.

CHARTERS TOWERS.—Towers Pastoral, Agricultural, and Mining Association. Show dates: 13th and 14th July. Geo. Urquhart, Secretary.

CROW'S NEST.—Crow's Nest Agricultural, Horticultural, and Industrial Society. R. J. M. Collin, Secretary. Show dates: 15th and 16th April.

GYMPIE.—Gympie Agricultural, Mining, and Pastoral Society. F. W. Shepherd, Secretary. Show dates: 12th and 13th November.

HERBERTON.—Herberton Mining, Pastoral, and Agricultural Association. E. C. Wright, Secretary. Show dates: 28th and 29th March.

INGHAM.—Herbert River Pastoral and Agricultural Association. J. A. Cartwright, Secretary. Show dates: 2nd and 3rd September.

KANDANGA.—Mary Valley Agricultural, Horticultural, and Industrial Society. G. A. Ellis, Secretary. Show dates: 17th and 18th July.

KINGAROY.—Agricultural, Pastoral, and Industrial Society. E. T. Ambrose, Secretary. Show dates: 27th and 28th April.

LOCKYER.—Agricultural and Industrial Society. F. Beckman, Secretary. Show dates: 13th and 14th July.

MAROOCHY.—Maroochy River Branch of the Queensland Farmers' Union. F. T. Latten, Secretary. Show dates: 20th and 21st February.

MOUNT LARCOM.—Wilmott Farmers' Progress Association. J. J. Kelly, Secretary. Show date: 8th October.

NANANGO.—Nanango Agricultural, Pastoral, and Mining Society. W. D. Darley, Secretary. Show dates: 20th and 21st March.

ROMA.—Western Pastoral and Agricultural Association of Queensland. F. W. Mills, Secretary. Show dates: 17th and 18th May.

SOUTHPORT.—Agricultural, Horticultural, and Industrial Society. E. Fass, Secretary. Show date: 26th September.

WONDAI.—Wondai Agricultural, Pastoral, and Industrial Society. G. D. Griffith, secretary. Show dates: 4th and 5th May.

WOOMBYE.—North Coast Agricultural and Horticultural Society. E. E. McNall, Secretary. Show dates: 15th and 16th June, 1921.

ZILLMERE.—Zillmere Agricultural, Horticultural, and Industrial Society. A. B. Marquis, Secretary. Show date: 10th September.

"ENGINEERING FOR LAND DRAINAGE," BY CHARLES HEATON ELLIOTT, C.E.

[Published by John Wiley and Sons, New York, and Chapman and Hall, London.]

This is another addition to the copious literature already existing on this subject; that it is appreciated, however, is proved by the fact that a third edition has become necessary, and a total of 11,000 copies have been printed. Much of the reliable information now to be obtained is found in large Engineering volumes too unwieldy to be of practical and immediate daily use. This volume is of compact and handy size, and really contains all that is necessary to be known on the various phases of the subject. While useful to the intelligent farmer or landowner, it is really intended for the professional man whose time is mainly occupied in such work. In newly-settled countries like Australia, where plenty of land is available for most purposes, "land reclamation" on a large scale is not so urgent as in older and more densely populated countries. Nevertheless, it is frequently found that there are large areas near the centres of population which require professional attention. The chapter on the "development of land drainage" gives an interesting résumé of the work already done in other countries. Other chapters deal strictly with technicalities and

are most useful to those intelligent farmers or landowners wishing to deal with their own lands, or to the professional drainage engineer entrusted with extensive works of this character.

The drainage of irrigated lands is ably dealt with, and as more land is brought under irrigation in this country it will be realised that a perfect system of underdrainage is as essential to success as a copious application to the surface.

The drainage of "house surroundings," such as lawns, gardens, orchards, stockyards, &c., forms a fitting conclusion to a subject of great interest to the general farmer, while the professional man who, unfortunately, in this country could not find sufficient demand for his services to require specialisation in this branch of work, will find it a handy volume for reference.

HORSE VALUES IN NEW SOUTH WALES.

Messrs. Bedford, Taylor, and Weston, Limited, the well-known Horse Salesmen of Wellington, New South Wales, report a most successful Horse Sale at their yards on 15th and 16th February, when 500 head were yarded to a good attendance of Buyers from Sydney and the Southern and Western Districts. The horses yarded were a good quality lot, and included the "Baratria" Station, Longreach, horses, which met with keen competition, realising up to £41 for Draughts and £17 for Light Horses. The market all round was good and solid throughout the sale, particularly for anything showing quality, which sold at much improved rates. Four hundred and eighty-four head were sold during the two days, best weighty Draughts making £30 to £41; medium and active sorts, £20 to £28; Light, £15 to £18; Growers, £10 to £20; Best Light Horses, to £17; Ponies, £8 to £17.

This firm will be holding big sales in March and April, and Owners having horses to dispose of should communicate with them, as they advise sending.*

Answers to Correspondents.

THE CULTIVATION OF RED CABBAGE.

All cabbages require a deep friable loam in which plenty of humus is available. If farmyard manure is applied, it should be well rotted and dug in at least two months prior to planting out.

Raise seedlings in a bed, and for this latter nothing equals compost. Sow the seed thinly in drills spaced 4 in. apart in the bed. Plants raised in this method are hardier than those sown broadcast.

Transplant when seedlings are 4 in. to 5 in. high, choosing cloudy and, if possible, showery weather. Plant in drills spaced 2 ft. 6 in. apart with plants 2 ft. apart in the rows. Keep down weed growths, and gradually hill up the plants during each cultivation.

If troubled with aphis, use strong tobacco solution; if cabbage moth, kerosene emulsion.

Sow from present month to May for red cabbage.

Varieties:—Red Drumhead, but, if procurable, preferably Red Zenith.

DESTRUCTION OF NUT GRASS.

"POULTRY FARMER," Murarrie—

See article in this issue of the Journal on the subject.

The Markets.

PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR FEBRUARY, 1921.

Article		FEBRUARY. Prices.
Bacon	lb.	1s. 4½d.
Barley	bush.	...
Bran	ton	£9 5s.
Broom Millet	„	£27 to £32
Broom Millet (Sydney)	„	£40 to £50
Butter (First Grade)	cwt.	238s.
Chaff, Lucerne	ton	£7 to £8 10s.
Chaff, Mixed	„	£7 10s. to £8 10s.
Chaff, Oaten (Imported)	„	...
Chaff, Oaten (Local)	„	£7 10s. to £8 6s.
Chaff, Panicum	„	£5 10s.
Chaff, Wheaten	„	£5 10s. to £7
Cheese	lb.	1s. 2d.
Flour	ton	£19 17s. 6d,
Hams	lb.	1s. 8d. to 2s.
Hay, Lucerne	ton	£7 to £9
Hay, Oaten	„	...
Honey (Nominally)	lb.	4¾d. to 5d.
Maize	bush.	4s. 10d. to 5s.
Oats	„	3s.
Onions	ton	£6 to £10
Peanuts	lb.	6d. to 7d.
Pollard	ton	£10
Potatoes (English)	„	£5 10s. to £10 5s.
Potatoes (Sweet)	„	£2 10d. to £3 10d.
Pumpkins (Cattle)	„	£2 10s. to £4 10s.
Eggs	doz.	1s. to 2s. 2d.
Fowls	per pair	4s. 6d. to 11s.
Ducks, English	„	5s. 5d. to 6s. 6d.
Ducks, Muscovy	„	7s. 6d. to 10s. 6d.
Geese	„	10s. 6d. to 12s. 6d.
Turkeys (Hens)	„	15s. to 20s.
Turkeys (Gobblers)	„	25s. to 45s.
Wheat	bush.	8s. 9d.

VEGETABLES—TURBOT STREET MARKETS.

Asparagus, per dozen bundles	...
Beans (French), per sugar bag	2s. to 4s. 6d.
Beetroot, per dozen bundles	...
Cabbages, per dozen	4s. 6d. to 9s. 6d.
Carrots, per dozen bunches	1s. to 2s.
Cucumbers, per dozen	3d. to 1s. 6d.
Lettuce, per dozen	...
Marrows, per dozen	1s. to 2s. 9d.
Peas, per sugar bag	8s. to 15s.
Potatoes (Sweet), per sugar bag	2s. 6d. to 3s. 6d.
Pumpkins (table), per doz.	1s. 6d. to 6s.
Rhubarb, per bundle	...
Tomatoes, per quarter case	2s. 6d. to 4s.
Tomatoes (inferior), per quarter case	...
Turnips (Swede), per cwt.	...

SOUTHERN FRUIT MARKETS.

Article.	FEBRUARY. Prices.
Bananas (Tweed River), per double case	...
Bananas (Queensland), per double case	10s. to 23s.
Bananas (Fiji), per double case	...
Cape Gooseberries, per case	...
Lemons, per bushel case	10s. to 15s.
Mandarins, per case	...
Oranges (common), per bushel case	...
Oranges (Navel), per bushel case	...
Passion Fruit, per half bushel case	5s. to 7s.
Pineapples (Queensland), per double case	6s. to 11s.
Pineapples (Queen's), per double case	6s. to 12s.
Pineapples (common), per double case	4s. to 7s.
Tomatoes (Queensland), per quarter case	8s. to 12s.

PRICES OF FRUIT—TURBOT STREET MARKETS.

Apples, Eating, per bushel case	6s. to 12s.
Apples, Cooking, per bushel case	4s. to 7s.
Apricots (prime), per half-bushel case	2s. to 8s.
Bananas (Cavendish), per dozen	3½d. to 5½d.
Bananas (Sugar), per dozen	2d. to 5d.
Bananas (Lady's Finger), second quality, per dozen	...
Cherries, per tray	12s. to 16s.
Cocoanuts, per sack	£1 5s.
Figs, per dozen boxes	3s. to 7s. 6d.
Lemons (Lisbon), per quarter case	3s. to 6s.
Mangoes, per bushel case	3s. to 8s. 5d.
Nectarines, per bushel case	2s. to 6s. 6d.
Oranges, per case	2s. to 3s.
Papaw Apples, per tray	2s. to 6s.
Passion Fruit, per half-bushel case	5s. to 10s. 6d.
Pears, per half-bushel case	8s. to 14s.
Peaches, per half-bushel case	3s. to 9s.
Persimmons, per half-bushel case	2s. to 5s.
Pineapples (smooth), per case	2s. 6d. to 4s.
Pineapples (rough), per case	1s. 6d. to 5s. 6d.
Pineapples (Ripley Queen), per case	...
Plums, per case	3s. to 6s. 6d.
Rockmelons, per dozen	1s. to 6s.
Tomatoes, per quarter case	2s. 6d. to 4s.
Water-melons, per dozen	1s. to 12s.
Grapes, per lb.	2½d. to 7d.

TOP PRICES, ENOGGERA YARDS, JANUARY, 1921.

Animal.	JANUARY. Prices.
Bullocks	£18 10s. to £22 17s. 6d.
,, (Single)	£30
Cows	£14 17s. 6d. to £16 10s.
Merino Wethers	30s. 6d.
Crossbred Wethers	30s. 9d.
Merino Ewes	21s. 9d.
Crossbred Ewes	30s. 9d.
Lambs	23s. 6d.
Pigs (Backfatters)	...
Pigs (Bacon)	...
Pigs (Porkers)	...

Farm and Garden Notes for April.

FIELD.—The wheat land should now be ready for sowing the early wheats, and that which has not been prepared should be ploughed without delay, April, May, and June at latest being the months for sowing. The main potato crop, planted in February and March, will be ready for a first or second hilling up. The last of the maize will have been got in. Where cotton is grown, the pods will now be opening, and advantage should be taken of dry weather to get on with the picking as quickly as possible. Picking should not be begun until the night dew has evaporated nor during rain. Sorghum seed will be ripe. Tobacco also will be ripening, and either the leaves or the whole plant harvested. Lucerne may be sown, as the growth of weeds has now slacked off, but the ground must be thoroughly prepared and cleaned. Sow oats, barley, rye, wheat, mangolds, and Swede turnips. Plant out paspalum roots, Seed wheat of whatever variety soever should be dipped in a solution of sulphate of copper (bluestone) in the proportion of 1 lb. of sulphate to 24 gallons of water. The seed may also be treated with hot water by plunging it in a bag into hot water at 120 degrees Fahr. for a minute or two, and then into water heated to 135 degrees Fahr. Allow it to remain in this for ten minutes, moving it about all the time. Then plunge the seed into cold water and spread out to dry. This plan is useful in districts where bluestone may not be obtainable. Another safeguard against blunt, smut, black and red rust is to treat the seed with formalin at the rate of 1 lb. of formalin to 40 gallons of water. Schering's formalin is sold in bottles. It is colourless and poisonous, and should be kept where no children or persons ignorant of its nature can have a chance of obtaining it. To treat the seed, spread it on a wooden floor and sprinkle the solution over it, turning the grain over and over until the whole is thoroughly wetted. Then spread it out to dry, when it will be ready for sowing. Instead of sprinkling, dipping may be resorted to. A bushel or so of seed is placed in a bag and dipped in the solution. During five minutes the bag is plunged in and out, and then the seed is turned out to dry. Formalin is less injurious to the grain than bluestone, but, while the latter can be used over and over again, formalin becomes exhausted. It therefore follows that only the amount required for immediate use for sprinkling should be prepared. Do not sow wheat too thickly. Half a bushel to the acre is sufficient—more on poor land and less on rich soils. On light, sandy soil the wheat should be rolled. On sticky land it should only be rolled when the land is dry, otherwise it will cake, and must be harrowed again after rolling. When the wheat is 6 in. high go over it with light harrows. If the autumn and winter should prove mild and the wheat should lodge, it should be kept in check by feeding it off with sheep.

KITCHEN GARDEN.—Hoe continually among the crops to keep them clean, and have beds well dug and manured, as recommended last month, for transplanting the various vegetables now coming on. Thin out all crops which are overcrowded. Divide and plant out pot-herbs, giving a little water if required till established. Sow broad beans, peas, onions, radish, mustard and cress, and all vegetable seeds generally except cucumbers, marrows, and pumpkins. Early celery should be earthed up in dry weather, taking care that no soil gets between the leaves. Transplant cauliflowers and cabbages, and keep on hand a supply of tobacco waste, preferably in the form of powder. A ring of this round the plants will effectually keep off slugs.

FLOWER GARDEN.—The operations this month will depend greatly on the weather. If wet, both planting and transplanting may be done at the same time. Camellias, gardenias, &c., may be removed with safety. Plant out all soft-wooded plants such as verbenas, petunias, pentstemons, &c. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stocks, candytuft, phlox, sweet peas, &c. Those already up must be pricked out into other beds or into their permanent positions. Growth just now will not be too luxuriant, and shrubs and creepers may be shortened back. Always dig the flower beds rough at first, then apply manure, dig it in, and after this get the soil into fine tilth. Land on which you wish to raise really fine flowers should have a dressing of bonedust lightly turned in. Wood ashes also form an excellent dressing for the garden soil. Prune out roses. These may be planted out now with perfect success. Take up dahlia roots, and plant bulbs as recommended for March. Layers that have made sufficient roots should now be gradually severed from the plant, and left for a fortnight before potting, to ripen the young roots.

Orchard Notes for April.

THE SOUTHERN COAST DISTRICTS.

The gathering and marketing of citrus fruit, as well as of pines, bananas, custard apples, persimmons, &c., is the principal work of the month. In the Notes for March attention was drawn to the necessity for keeping all pests in check, particularly those attacking the ripening fruit. As it is the height of folly to look after the orchard thoroughly during the growing period of the crop and then to neglect the crop when grown, every possible care must be taken to keep fruit fly, peach moth, black brand, or other pests that destroy or disfigure the fruit in check, and this can only be accomplished by combined and systemtic action. Citrus fruit at this time of the year often carries badly, as the stem is tender, easily bruised, full of moisture, and, consequently, very liable to the attacks of the blue mould fungus, which causes specking. The loss from this cause can be lessened to a considerable extent by carefully attending to the following particulars:—

1st. Never allow mouldy fruit to hang on the trees or to lie about on the ground. It should be gathered and destroyed, so that the countless spores which are produced by the fungus shall not be distributed broadcast throughout the orchard, infesting many fruit, and only waiting for a favourable opportunity, such as an injury to the skin by an insect or otherwise, combined with favourable weather conditions (heat and moisture), to start into growth.

2nd. Handle the fruit carefully to prevent bruising. Cut the fruit, don't pull it, as pulling is apt to plug the fruit—that is to say, to either pull the stem out or injure the skin round the stem—and a fruit so injured will go mouldy.

3rd. Sweat or dry the fruit thoroughly; if the weather is humid, laying the fruit out in the sun on boards or slabs is a very good plan.

4th. After sweating, examine the fruit carefully, and cull out all bruised or punctured fruit, and only pack perfectly sound dry fruit. It is better for the loss to take place in the orchard than for the loss to take place in the case in transit.

5th. If the mould is very bad, try dipping the fruit for a few seconds in a 2 per cent. solution of formalin. This will kill the spores, and if the fruit is placed in the sun and dried quickly before packing there will not be much chance of its becoming reinfested.

Don't gather the fruit too green, especially such varieties as the Beauty of Glen Retreat mandarins, as immature fruit spoils the sale of the good article.

If the orchard has not been cleaned up after the summer rains, do so now; and do any other odd jobs that may be required, such as mending fences, grubbing out dead or worthless trees, cleaning out drains, &c.

Strawberry plantings may be continued, and where new orchards are to be planted continue to work the soil so as to get it into the best possible tilth.

THE TROPICAL COAST DISTRICTS.

Clean up the orchards after the rainy season. Look out for scale insects, and cyanide or spray for same when necessary.

Go over the trees carefully, and when there is dead wood or water sprouts remove them. If bark fungus is showing, paint the affected branches with sulphur and lime wash. Clean up bananas, pineapples, and other fruits, as after the end of the month it is probable that there will not be any great rainfall, so that it is advisable to keep the ground well cultivated and free from weeds, so as to retain in the soil the moisture required for the trees' use during the winter months. Keep bananas netted; destroy guavas wherever found.

THE SOUTHERN AND CENTRAL TABLELANDS.

If the orchards and vineyards have not already been cleaned up, do so. Cultivate or plough the orchard, so as to get the surface soil into good tilth, so that it can absorb and retain any rain that falls, as, even though the trees will simply be hardening off their summer's growth of wood, it is not advisable to let the ground dry out. When citrus fruits are grown, attend to them in the manner recommended for the Southern Coast Districts; and, when grown in the dry parts, keep the land in a state of good cultivation. Should the trees require it, a light watering may be given. Do not irrigate vines; let them ripen off their wood.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING JANUARY, 1921 AND 1920, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of Years' Records.	Jan., 1921.	Jan., 1920.		Jan.	No. of Years' Records.	Jan., 1921.	Jan., 1920.
North Coast.	In.		In.	In.	*South Coast*—continued:	In.		In.	In.
Atherton	12·41	19	7·37	12·90	Nambour	8·93	24	9·18	22·32
Cairns	16·94	38	15·65	18·64	Nanango	4·52	38	3·32	6·70
Cardwell	17·13	48	12·44	25·67	Rockhampton ...	9·18	33	4·67	11·58
Cooktown	14·87	44	33·67	9·41	Woodford	7·18	33	8·81	15·50
Herberton	9·82	33	5·22	11·84					
Ingham	16·88	28	15·39	13·99					
Innisfail	23·96	39	18·19	13·73					
Mossman	18·94	12	13·72	16·22					
Townsville	11·91	49	5·75	11·71	*Darling Downs.*				
					Dalby	3·28	50	2·31	6·49
Central Coast.					Emu Vale	3·22	24	0·83	3·23
					Jimbour	3·76	32	3·21	5·01
Ayr	12·26	33	8·09	15·90	Miles	3·90	35	2·42	4·52
Bowen	10·37	49	6·99	19·24	Stanthorpe ...	3·62	47	1·07	2·53
Charters Towers ...	5·74	38	8·81	7·75	Toowoomba ...	4·97	48	2·94	6·74
Mackay	15·21	49	15·91	20·41	Warwick	3·59	33	1·25	4·44
Proserpine	18·48	17	14·96	17·17					
St. Lawrence ...	9·75	49	18·30	22·11	*Maranoa.*				
					Roma	3·48	46	1·41	1·66
South Coast.									
					State Farms, &c.				
Biggenden	5·38	21	5·37	7·03					
Bundaberg	9·19	37	7·41	11·37					
Brisbane	6·42	68	4·04	11·86					
Childers	7·87	25	5·52	12·27	Bungeworgorai ...	2·26	6	1·35	2·68
Crohamhurst ...	13·02	25	12·41	21·11	Gatton College ...	4·32	21	2·34	5·47
Esk	5·47	33	3·96	11·69	Gindie	4·03	21	3·12	4·33
Gayndah	4·81	49	4·94	5·63	Hermitage ...	2·79	14	1·83	5·54
Gympie	6·61	50	6·41	16·67	Kairi	8·70	6	5·19	9·46
Glasshouse M'tains	8·60	12	8·38	16·04	Sugar Experiment Station, Mackay	16·94	23	12·70	21·87
Kilkivan	5·68	41	4·15	10·79	Warren	7·18	6	4·80	7·26
Maryborough ...	7·32	49	7·34	12·35					

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for January, 1921, and for the same period of 1920, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, State Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

1921.	JANUARY.		FEBRUARY.		MARCH.		APRIL.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	4·57	6·45	5·22	6·42	5·41	6·20	5·58	5·46
2	4·58	6·45	5·22	6·41	5·41	6·19	5·58	5·45
3	4·59	6·45	5·23	6·41	5·42	6·18	5·59	5·44
4	4·59	6·46	5·24	6·40	5·43	6·17	5·59	5·43
5	5·0	6·46	5·24	6·40	5·43	6·16	6·0	5·42
6	5·1	6·46	5·25	6·39	5·44	6·15	6·0	5·41
7	5·2	6·47	5·26	6·38	5·45	6·14	6·1	5·40
8	5·2	6·47	5·27	6·38	5·45	6·13	6·1	5·39
9	5·3	6·47	5·27	6·37	5·46	6·12	6·2	5·38
10	5·4	6·47	5·28	6·36	5·46	6·10	6·2	5·37
11	5·5	6·47	5·29	6·36	5·47	6·9	6·3	5·35
12	5·5	6·47	5·30	6·35	5·47	6·8	6·3	5·34
13	5·6	6·47	5·30	6·34	5·48	6·7	6·4	5·33
14	5·7	6·47	5·31	6·33	5·48	6·6	6·4	5·32
15	5·8	6·47	5·32	6·33	5·49	6·5	6·5	5·31
16	5·9	6·47	5·32	6·32	5·49	6·4	6·5	5·30
17	5·9	6·47	5·33	6·31	5·50	6·3	6·6	5·30
18	5·10	6·47	5·34	6·30	5·50	6·2	6·6	5·29
19	5·11	6·47	5·34	6·30	5·51	6·1	6·7	5·28
20	5·12	6·46	5·35	6·29	5·51	6·0	6·7	5·27
21	5·12	6·46	5·36	6·28	5·52	5·59	6·8	5·26
22	5·13	6·46	5·36	6·27	5·52	5·58	6·8	5·25
23	5·14	6·45	5·37	6·26	5·53	5·57	6·9	5·24
24	5·15	6·45	5·38	6·25	5·53	5·56	6·9	5·23
25	5·15	6·45	5·38	6·24	5·54	5·55	6·10	5·22
26	5·16	6·44	5·39	6·23	5·54	5·53	6·10	5·21
27	5·17	6·44	5·40	6·22	5·55	5·52	6·11	5·20
28	5·18	6·44	5·40	6·21	5·55	5·51	6·11	5·20
29	5·19	6·43	...	...	5·56	5·50	6·12	5·19
30	5·20	6·43	...	...	5·56	5·49	6·12	5·18
31	5·21	6·43	...	...	5·57	5·48	...	...

PHASES OF THE MOON, ECLIPSES, &c.

(The times stated are for Queensland, New South Wales, and Victoria, where the clock time is identical).

			H.	M.	
9 Jan.	●	New Moon	3	27	p.m.
17 „	☾	First Quarter	4	31	p.m.
24 „	○	Full Moon	9	8	a.m.
31 „	☽	Last Quarter	6	2	a.m.

Apogee on 9th. Perigee on 23rd.

8 Feb.	●	New Moon	10	37	p.m.
16 „	☾	First Quarter	4	53	a.m.
22 „	○	Full Moon	7	33	p.m.

Apogee on 5th. Perigee on 21st.

1 Mar.	☽	Last Quarter	abt. m'night		
10 „	●	New Moon	4	9	a.m.
17 „	☾	First Quarter	1	49	p.m.
24 „	○	Full Moon	6	19	a.m.
31 „	☽	Last Quarter	7	13	p.m.

Apogee on 5th. Perigee 21st.

8 Apr.	●	New Moon	7	5	p.m.
15 „	☾	First Quarter	8	12	p.m.
22 „	○	Full Moon	5	50	p.m.
30 „	☽	Last Quarter	2	9	p.m.

Apogee on 2nd and 30th. Perigee on 17th at 3 p.m.

ECLIPSES.

An Annular Eclipse of the Sun visible in North of Scotland but not in Australia will occur on April 8th.

An Eclipse of the Moon will occur on April 22nd, when the Moon will rise totally eclipsed.

The Planets Venus, Mars, and Uranus will be remarkably close together apparently on January 9th, and will form a fine celestial picture with the Moon on the 13th.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun would rise about 4 minutes later than at Brisbane if it were not for its higher elevation, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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